THE IRON TRADE REVIEW

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THE IRON TRADE REVIEW.

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CLEVELAND, O., JUNE 6, 1889.

THE WEEK IN IRON CIRCLES.

General Features. The significant event of the week has been the placing of quite extensive orders for steel rails, indicating an early revival in that important industry. Altogether, orders to the amount of about 75,000 ton swere booked by Eastern mills, mainly for Pacific Coast delivery, and Chicago mills are about closing negotiations for not less than 100,000 tons. Prices remain low, but with a hardening tendency. These sales, we understand, about complete this year's allotment of the Steel Rail Association. The Chicago market appears to be looking up. Negotiations referred to in our previous reports, looking to placing large contracts, culminated during the past week, and orders for over 20,000 tons have been booked. This comes mainly from the agricultural implement interest, which has entered the market nearly two months earlier than is the custom. This business has been confined largely to the local brands of Lake Superior coke iron, with Ohio and Southern brands for mixture. The buying demonstrated the fact that it is harder to place orders at minimum current prices for large blocks of iron than for the car-load lots that have been the feature of the market for some weeks past. At Detroit, while buying is mostly confined to car-loads and 50-ton lots, a few larger sales have been booked, and inquiries for several thousand tons have been received; but as the prices buyers are offering are in most cases considerably lower than sellers will accept, these inquiries may not result in immediate sales. Out of five furnaces at Detroit, or in the near vicinity, with a total weekly capacity of about 1,400 tons, three are out of blast, and the two in blast have a weekly output of only about 400 tons, and there are several others in the State also idle. The surface indications of the Cincinnati market show as demoralizing and unsatisfactory a condition as ever. Prices are irregular, uncertain and terribly low, but there is a strong under-current towards better things. The consumption of iron in many of the heavy lines is increasing, so that the amount of iron pressing to sell is less prominent every week. The past week has developed in a quiet way a number of large transactions, making the volume of business at Cincinnati better than the tone of the market or prices would indicate. The heaviest curtailment in production is in the direction of softeners and silvery grey iron. From Louisville comes the report that there has been some change in prices during the past week, and some sales have been made for deliveries throughout the year. There is a scarcity of bright and silver grey irons, where buyers desire immediate shipment. Recent inquiries at St. Louis have shown such an unlooked-for weakness in prices of certain brands, that buyers are inclined to wait and see whether the bottom has actually been reached. At Pittsburgh concessions in prices are reported as having been made by parties anxious to realize, but on the other hand, many makers and holders of pig iron are more indifferent than ever about selling at the prices now ruling, believing that some reaction must soon take place. Our Manchester (England) correspondents, Messrs. S. W. Royce & Co., report under date of May 25: "The demand for pig iron at both Glasgow and Middlesbro' has latterly eased somewhat, and prices are some 6d. to 9d. per ton lower than at the commencement of the current month. Makers, however, have, for the present very little iron for sale, and the fall in values is caused by those who having bought iron speculatively, are now, with the slackening of demand, wishful to realize. The total shipments of pig iron for the month of April, 1889, are, according to the Board of Trade returns, 110,247 tons of the value of £242,185, as against 101,272 tons, value £211,528, during the corresponding month of last year."

Iron Ore. The market is dull and quiet, and the prospects for the next sixty days are not of a character to indicate any considerable quantity of new sales. Aside from the peculiar and depressing conditions which, for sometime past, have had a downward tendency as to prices, a point has been reached which makes further extensive sales a matter of remote possibility only. Furnacemen, as a rule, have bought largely, and do not wish to cover their entire season's wants until they shall have further assured themselves of what the future may have in store for them, while the ore producers have likewise disposed of as much ore as they care to sell at this time, preferring also to wait until they have thoroughly canvassed the situation toward the latter end of the season. It may, therefore, be accepted as a generally understood fact that little will be done in the ore line until the end of July or the beginning of August, when sufficient time will have elapsed to enable both producer and consumer to act with a better understanding. Experience in the past has demonstrated the fact that ore quotations are apt to advance at about the time named, and hitherto a rise in lake freights has brought with it an advance in ore prices. Whether or not the pig iron market will have recovered sufficiently sixty days hence to stand such an advance remains to be seen. The ore shipments to Lake Erie ports to date exceed by far all previous years, and while the total output for the season is still a matter of conjecture, there is little doubt that it will overrun the '88 figures all the way from half a million to a million tons.

Pig Iron. Despite all the talk of a better feeling, quotations remain stationary, and the activity displayed in the pig iron market, if such a term is applicable at this stand-still in the iron industry, is confined to the smallest possible limit. Furnace firms everywhere unite in the complaint of dull times and cut-throat prices, and, while a multiplicity of reasons exist for this depressing state of affairs, the fact remains that the notable lack of confidence in the market is the prime factor for this deplorable condition. It is agreed on all sides that the present pig iron quotations represent the actual cost to the furnace-man, and that to ask a still further reduction would be in the nature of a demand for iron at a sacrifice to the manufacturer. Yet in the face of this all too patent fact, the consumers of pig iron still insist upon reductions wherever possible, and by their method of hand-to-hand purchase, aggravate rather than assist the market. What is wanted is a healthy trade, even though quotations are low, and nothing will bring about such a condition but the placing of heavy orders for future delivery. Consumers of pig iron surely cannot expect lower prices in the future, and it is almost certain that when they do get ready to buy they will pay more for it than present prices.

Merchant Iron. Here, too, very little is doing in the way of purchases, and consumers confine their orders to the smallest quantities. Bar iron is weak, while sheets have not as yet been offered in large quantities. There is, however, considerable trade in steel rails, for which several heavy orders are reported at prices which will yield no profit to the mills at the ruling prices.

Scrap Iron. There is an abundance on hand of all kinds of material, and at old quotations, but the demand is limited and barring some axles, which always find a market, nothing noteworthy is reported by way of sales.

Hardware. Jobbers report a continuance of the excellent business in all its lines. Tin-plate is very scarce, owing to the strikes abroad. Metals are firm, excepting copper, which has dropped. Cut nails are firm at $1.75 at the mill. Steel nails are now sold under the new card, and in kegs.

A GREAT IRON CONCERN'S LOSS.

The direct and indirect financial loss, by reason of the appalling flood in the Conemaugh Valley of Pennsylvania, last week, can never be accurately estimated. Allowing for natural exaggeration, it would seem that the generally accepted estimate of $40,000,000 is not unreasonable, when it is considered that not only was great loss, both individual and corporate, entailed, but that in many, very many, instances entire assets were swept away in a moment, beyond all recovery.

Upon no one corporation, not even excepting the Pennsylvania Company, has the direct financial loss fallen with greater force than upon the Cambria Iron Company. That company was the warm, beating heart of the industrial life and activity of the entire valley. Its influence extended in all directions. Upon it depended a dozen important collateral industries. The money which it regularly dispensed for labor furnished the industrial life-blood for the region round about. Its works were among the most extensive in the country, including six iron furnaces, with stacks 75 feet high; the spiegel furnace; six Bessemer cupolas; three revolving open-hearth furnaces, supplied with natural gas; two large blooming trains; eight Siemens heating furnaces; a rolling mill with six trains, and ten heating furnaces; four puddling furnaces; a wire rod mill, making 80,000 pounds each turn; nut and bolt works; axle and forging shops; the Gautier steel department, turning out wire, shafting, springs, plowshares, rake and harrow teeth, etc.

In addition were foundries, pattern and other shops and drafting offices. The company also owns 50,000 acres of mineral lands, controls 1,500 acres of coking land in the Connellsville region, and extensive Bessemer ore mines in Michigan.

Its various employes numbered upwards of 7,500. It owned 700 houses, which were rented or sold to employes at reduced prices and upon extremely favorable terms. The Cambria Library building was built by the company and presented to Johnstown. The Cambria Mutual Benefit Association was organized in the interest of the employes. Under the control of the Board of Directors of this Association was the Cambria Hospital, which was erected at the Iron Company's expense in 1886. The Cambria Club-House was opened in 1881 for the entertainment of guests of the company and employes. Fair treatment on its part made strikes of very rare occurrence.

Published estimates of the loss of the company place it at from $2,000,000 to $2,500,000. It can scarcely be less than the latter figure, for the upper mill is totally wrecked, the lower mill is damaged to such an extent that all machinery and buildings are useless, the Gautier wire mill was destroyed, the great supply stores were swept away, the company's handsome office was ruined, and, of course, most of the tenement houses are gone. Greater than this property loss, however, is the loss of many of its most faithful lieutenants and employes. Among these may be named James McMillan, one of its Vice-Presidents, and John Fulton, General Manager. Cyrus Elder, the well-known solicitor of the company, mourns the loss of wife and daughter.

In the midst of this almost crushing calamity, the recuperative power of the company has been amazingly demonstrated. Scarcely had the waters subsided, before it was announced that the work of cleaning-up and rebuilding would immediately begin. The company generously telegraphed to a New York firm for a train-load of provisions, and sent a corps of butchers to its farms, two miles back in the country, to slaughter all of its blooded cattle for the supply of everyone, free. Word has been received by the Cleveland agents of the company that it will keep up the usual requirements of raw materials, which means an annual purchase and consumption of 400,000 tons of Lake Superior Bessemer ores, besides 100,000 tons of Bessemer pig. All of this signifies practically unlimited resources, as well as a hopefulness and buoyancy little short of heroic, and we join in wishing this great and beneficent concern a safe and immediate return to a prosperity which it so richly deserves.

LAKE SUPERIOR ORES FOR THE SOUTH.

Our Lake Superior letter this week conveys the information that Southern iron manufacturers have been making inquiry with a view to ascertaining the cost of transporting Lake Superior Bessemer ores to Southern furnaces for the purpose of mixing with their native ores and thereby enhancing the value of their pig iron product. According to our correspondent's advices, the best combined rate of rail that they could obtain was $6.00 per ton. Let us see to what this would bring the cost of the ore laid down at the furnace. The market price, in Cleveland, of the best Bessemer hard ore at present is $5.25 per ton. Subtracting the rail freight from mine to shipping port, 70 cents; the lake freight to Cleveland, $1.25; and the commission and handling charges, 40 cents, the net cost at the mines would be, say, $3.40. Adding the rail freight to the South, $6.00, the cost laid down at the furnace would be $9.40. A good Gogebic Bessemer ore could, we suppose, be sold at the mine for $2.75, making the cost at furnace $8.75. Whether the Southern iron masters can see their way clear to pay the above prices, will no doubt be developed later on.

It is a significant fact, in connection with this subject, as showing the growing interchange of commodities between the two sections, that of the 224,634 tons of pig iron produced in 1888 by the Tennessee Coal, Iron and Railway Company, 156,620 tons, or 69 per cent., was sold to Northern and Western consumers, while Eastern points purchased only about 16 per cent., and the Southern States less than 14 per cent. By far the largest sales of this company were made to Ohio consumers, viz.: 65,561 tons, Missouri coming next with 23,733 tons, New York next with 22,493 tons, and so on down, Pennsylvania dropping to 6,777 tons, and North Carolina taking only 15 tons. It is proper to say, however, that the bulk of the Ohio sales, as we understand, was made to nail factories along the Ohio river, and does not represent the bold encroachment on the natural territory of Ohio furnaces that might at first glance appear. Nor is it a tithe of the total consumption of pig iron in territory tributary to Ohio furnaces. In the meantime, however, there has been a steady reduction of Southern freights, amounting to about 13 per cent. during the past year. In February, 1888, the rate from Birmingham to Cleveland was $4.60 per ton; now it is $4.00. From Chattanooga to Cleveland was $4.10 per ton; now it is $3.50. The talk of introducing Cuban ores into Southern furnaces is, of course, mere talk as yet, and the Chattanooga *Tradesman* discourages even talk on the subject, holding that the South's true success lies in the direction of the basic process.

STILL THE CUT GOES ON.

The era of cut rates on iron and steel products seems to be fully "on." Following the Pennsylvania Company's reduction on coke to Schuylkill Valley furnaces came the reduced freights on iron ore from lower-lake ports to the Mahoning and Shenango valleys and Pittsburgh. Then followed the announcement by the New York, Lake Erie & Western Railroad of a reduced rate from the Mahoning Valley to Chicago on manufactured articles of iron and steel from 13 and 15 cents to 10 and 13 cents. This was conceded to be a great victory for Mahoning Valley iron manufacturers, and the Pennsylvania and Lake Shore companies were not slow to see that something must be done for Pittsburgh, and that immediately. Accordingly, on Saturday last, the Pittsburgh committee of freight agents announced a cut on the iron rate to Chicago from 17½ and 15 cents to 11 and 14 cents. This is the lowest figure made within the past eight years, and fixes the new rates to East St. Louis at 17 and 13½ cents; to Milwaukee at 16 and 13 cents; to Mississippi River ports at 24½ and 19½; to Buffalo at 10 and 8 cents, etc. The new rail and lake rates to St. Paul and Minneapolis will be 17 and 21½ cents, a reduction of about 5 cents on the all-rail route. Coincident with these announcements comes the statement that the Wisconsin Central has reduced its iron rates from Chicago to St. Louis and Minneapolis from 20 and 17 cents to 17 and 14 cents in less than car and car-loads. Just what effect these several cuts will have on the iron market, with reference to Northern sales of Southern irons, will depend very largely upon their duration.

THE differences between the *Age of Steel* and THE IRON TRADE REVIEW, anent the pig iron storage scheme, simmered down, amount to this: The former insists that the scheme is a good thing for the Southern iron-makers; the latter is disposed to admit it. The former claims that speculation is only incidental to the scheme; the latter that it is essential to it. The former sees no particular harm from speculation *per se;* the latter believes that, while speculation has come to be, perhaps, a necessary evil, the evil has gone far enough in this country, and that any scheme which has for its essential object the introduction of the element of stock speculation into the iron market should be nipped in the bud. The former sees no force in the lesson taught by England's experience in the pig iron warrants; the latter does. The former thinks that in this matter THE IRON TRADE REVIEW is "prejudiced and unfair"; the latter thinks that, in this matter, the *Age of Steel* is candid and courteous—though misguided.

PHILADELPHIA is honored with the presence of Swamee Bhaskara Naud Saraspatee, preceptor of the Maharajah of Jodhpur, and two companions of equal note, Ganesh Ramachandra and Narain Singh, who came from far-off India for the purpose of studying American

iron and textile proceses, intending to introduce them into their native land. They will remain here several years. Here is Ramachandra's very sensible explanation of their purposes: "Our people are in a very bad way. We have no manufactures of any kind, and we want to learn about machinery and how to make iron. We want to get both theoretical and practical knowledge. We want to work in shops as Americans work, and also study scientific branches. We have been in Paris and in England, where there are quite a number of Indian gentlemen, we tried to get information about manufactures but we found the shops closed to us, and we were refused instruction. But we have been told that there is less prejudice against us here." The gentlemen from India can be assured that the doors of America's manufactories are wide open to such sensible investigators as appear to be our friends of the long and uncouth names.

THE IRON TRADE REVIEW is solicitious that the coming Federal Census should be as fair and complete as human ingenuity and care can make it. Therefore, it surrenders its space, for the address, in another column, to the medical profession in regard to vital statistics, and will continue to extend the use of its columns to the Census Office whenever it can in any way assist this important work.

THE nut and bolt combination, whose headquarters are at Cleveland and Philadelphia, appears to be strengthing its borders in all directions. Two Youngstown concerns recently joined it, and another at St. Louis is expected shortly to follow suit.

THE WORLD'S FUTURE IRON ORE SUPPLIES.

An interesting statistical examination of the iron ore requirements of the world, and the sources of the supplies thereof, was lately presented before the British Iron Trade Association by the president of that body, Mr. Josiah T. Smith. The paper was prepared with special reference to the iron industry in Great Britain, but that circumstance does not deprive of general interest a comprehensive discussion of the requirements and supply of a mineral which is of such universal occurrence as iron ore. The chief sources of supply, as pointed out by Mr. Smith, are the United Kingdom, the United States, Germany, France, Sweden, Austria and Spain. There are, according to him, no other countries in which iron ores are worked on a large scale, while in some countries, such as Canada, Cuba, the South American republics, India and China, the extent and character of the iron ore deposits have been very imperfectly determined.

The importation of iron ores into the chief iron-producing countries of the world is treated in the address before us as dating from about the year 1866, when the Bessemer process had been fairly set on foot. In that year Great Britain imported little or no ores, the only European countries receiving supplies of foreign ores being France, Germany, Belgium and Austria. The aggregate imports of those four countries amounted to nearly 900,000 tons, or about one-seventh of the total now imported into the chief iron-making countries from outside sources. In 1868 Great Britain began to cut some figure as an importer of iron ores. It imported 114,435 tons. These imports amounted to only 1.12 per cent. of the home production, which aggregated 10,169,000 tons. In 1877, for the first time, its imports of ore exceeded 1,000,000 tons. In 1880 they bounded up suddenly from 1,083,000 to 2,634,000 tons, while the imports for 1887 amounted to 3,762,000 tons. The experience of the other European countries mentioned, except Germany, has been similar to that of the United Kingdom. In Germany, as in England, France and Belgium, the iron ore imports increased year by year from 1866 to 1884. Since 1884 the iron ore resources of Germany have been largely developed, mainly in consequence of the development of the basic process. Within ten years the iron ore production of Germany has increased by nearly 3,900,000 tons, rising from 5,457,000 tons in 1878 to 9,351,000 tons in 1887. The progress that the basic process has made in Germany and the proximity of the leading works to large sources of iron ore supply justify the belief, according to Mr. Smith, that in the immediate future Germany is not likely to call for large requirements elsewhere.

Coming to the question of sources of supply, the speaker said that as far as Great Britain was concerned, it possessed a practically unlimited supply of lias iron ore, but that the supply of hematite ore available was more uncertain, and that though shown to be more abundant than was at one time supposed, it was doubtful whether the present annual output of about 2,500,000 tons could be largely augmented or indeed be quite maintained. The only two European countries outside of Great Britain which possess any considerable deposits of iron ore adapted for the making of high-class Bessemer iron are Spain and Sweden. Russia has large deposits of iron ore, especially in the Ural, but they are generally remote from the seaboard, and the cost of transporting them would be serious. Elban ores are becoming scarce. Additional supplies may be found in Algeria, but they are not much counted on at present.

Spain has two districts rich in ores of high quality, viz., that of Bilbao in the north, and that between Malaga and Carthagena in the south. Up to the present the former district has turned out about 40,000,000 tons in round numbers. The amount which remains unworked in the district is not known with any definiteness; estimates given in the paper place it at about 75,000,000 tons. Between Malaga and Carthagena there are some large and easily worked deposits of high-class ores, though no estimate of the amount of ore in the district is given. The ores of the south of Spain are as yet virtually untouched.

The mines in the north of Sweden are spoken of by Mr. Smith as those to which attention will be chiefly directed for future supplies to supplement those from the north of Spain. The mines at Gellivara, which have been worked on a small scale for local consumption for more than a century, are thought to contain enormous quantities of ore, though no estimate of the quantity is forthcoming. The iron mountains of Luossavara and Kunumivara, some sixty miles from Gellivara, are estimated, on the basis of government surveys, to contain about 270,000,000 tons. The ores at Gellivara and Kunumivara are higher in phosphorus than those at Luossavara. The president of the British Iron Trade Association estimates that the ores in Spain and Sweden are sufficient to insure supplies to Great Britain for a considerable period to come.

Two considerations likely to materially affect the future of the demand for iron ores in the United Kingdom were adverted to by Mr. Smith. One was the future development of the basic process—the other new discoveries of indigenous Bessemer ores. At present only 12 per cent. of all the steel made in the United Kingdom is made by the basic process, depending on the use of low-grade phosphoric ores; and while admitting that when the patents held under this process expire there may be a further advance in the manufacture of basic steel, Mr. Smith evidently does not look for any remarkable development in that direction. As regards high-class ores, the outlook is, he thinks, for a dependence on foreign supplies in the near future, with the chance of some of those supplies, such as those from Bilbao, becoming scarcer and dearer. The extent to which the United States are likely to come into the markets, whence European supplies are obtained, is another circumstance which is likely to affect the iron ore supplies of the United Kingdom. Mr. Smith said that the iron works on the Atlantic sea-board can draw supplies from Europe almost as cheaply as, if not more cheaply than, the works of Pittsburgh and Chicago, which have to transport Lake Superior ores for a distance varying from 700 to 1,000 miles. He regards the capability of European ores to compete with the native ores of the United States over a large area of consumption, as proved by the recent importation of 1,250,000 tons in one year, in spite of the duty. How far this economic situation is likely to affect the supplies which the United Kingdom can command is, he says, one of those problems which can only be settled by events. At present, he says, the only thing certain about the future of the American iron industry is its uncertainty. He expects, however, to see the present ruling price of ore affected, in the first place, by the probable adaptation of a good deal of the impure ores of the Lehigh Valley for Bessemer purposes by the process of magnetic separation, and, in the second place, by the development of the cheaper ores of the South.

The requirements of the other European countries constitute, of course, an element in the consideration of the question. As regards Germany, Mr. Smith thinks it improbable that the demand for imported ores will become greater in the future. Germany has been reducing her imports of ore and her production of Bessemer iron in recent years. The production of Bessemer pig in Germany fell from 734,000 tons, or 23 per cent. of the whole in 1882, to about 300,000 tons, or 7 per cent. of the whole in 1888. The future of the German iron industry appears, Mr. Smith says, to be identified with the basic process, for the production of which the country contains large deposits of cheap ores. As regards France, he says appearances seem to indicate that that country will not materially increase her present demand for imported Bessemer ores, and the same remark applies to Belgium, which has in the adjoining Grand Duchy of Luxemburg a practically unlimited supply of cheap ores suitable for the basic process. France has, like Germany, in recent years developed the basic process to a relatively greater extent than England, and nearly half the steel produced there is made by the basic process.

The question of supply is, of course, intimately connected with that of price, and in reference to the latter question Mr. Smith presented some considerations of interest. The iron ores of Bilbao have been a great reliance of British iron makers, who have been able to get them delivered at English furnaces at about one-half the price at which Lake Superior ores, over the same period, have been delivered at furnaces in the Eastern states. But he points out the possibility that as the ores of Bilbao become exhausted the Spanish government may impose restrictions upon exportations in the same way as the Italian government has done in relation to Elban ores, in which case British pig makers may be driven to other sources of supply earlier than has been anticipated. The Swedish and South Spanish ores can hardly be delivered as cheaply as those of Bilbao. The exact difference in the cost of the respective supplies cannot be ascertained for some time, and the effect upon the position of Great Britain as an iron producer cannot, therefore, be calculated at present. Referring to the probable effect upon the situation of the development of the iron industry in the South, Mr. Smith intimated that he did not look for any important increase in the imports of American made iron, in spite of the fact stated, on the authority of Mr. Hewitt, that iron can be produced in Birmingham, Ala., for about 30s. ($7.50) per ton. The economic effect of that development may, he said, be much more seriously felt in the Eastern states than in Great Britain, and if felt in Great Britain at all the effect will more likely be in the direction of withdrawing the American demand for high class European ores, a circumstance which, having regard to the limited supplies thereof, English iron makers should have no reason to regret.

For the above excellent condensation of Mr. Smith's paper we are indebted to *Bradstreet's Journal*.

Going Abroad for News.

"It is rumored," says the *Eastern Australasian and South African Journal of Commerce*, "that an American syndicate, with a capital of $50,000,000, has been formed to contruct a railway in Siberia, and that several former and present diplomatic and consular American agents are interested in the undertaking. It is singular how thoroughly these gentlemen share with Sir Robert Morier the view that there is money to be made by the development of Siberia."

A BIRMINGHAM (Conn.) firm sent a $6.500 rubber belt press to Italy.

NEW IRON-WORKING MACHINERY.

Power Shears for Bar Iron.

The accompanying engraving represents a shearing machine built, in six sizes, by the New Doty Manufacturing Co., Janesville, Wis. They are made especially for cutting bar iron—round and flat—the smallest machine weighing 600 pounds, capable of cutting 1″ round iron and 3x½″ flat iron. The largest weighing 10,000 pounds capable of cutting 3″ round iron and 6x2″ flat iron. As will be seen, the machine consists essentially of a shear lever moved by a

POWER SHEARS FOR BAR IRON.

cam which is on a shaft passing through under the lever. This shaft is driven by suitable gear wheels from a second shaft, which carries the fly-wheel, the clutch, and driving pulley. The blades for cutting flat bars and those for round iron are on opposite sides of the lever fulcrum, both being always in place and ready for use. The knives for round iron are the reverse of the bar, and do not flatten it in cutting, but leave the ends round. The gearing is proportioned ten to one, and all parts are made amply strong to resist the greatest strain which can be brought upon them.

Bolt Headers, Upsetters, Etc.

We present herewith views of some new and improved iron-working machinery manufactured by the Seaton Manufacturing Co., Cleveland, O., and

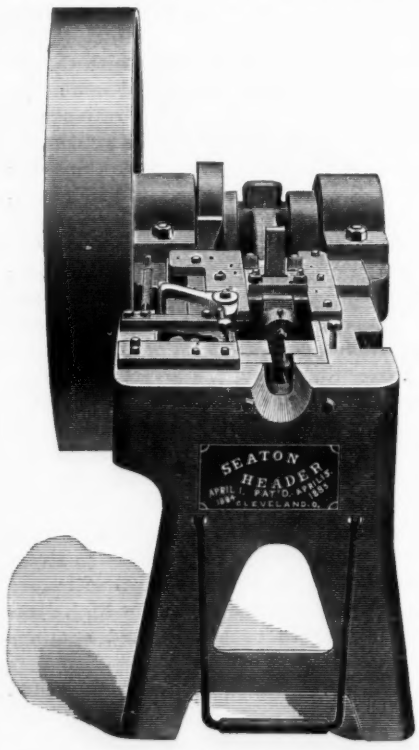

FIG. 1.

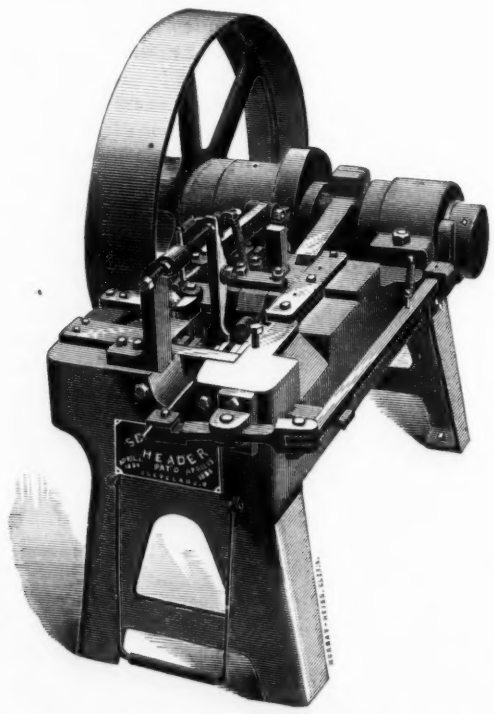

FIG. 2.—BOLT HEADERS, UPSETTERS, ETC.

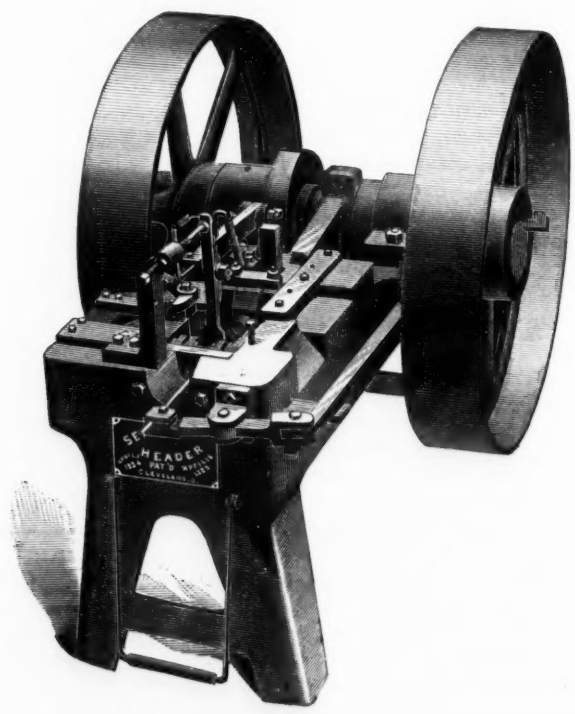

FIG. 3.

patented by Mr. C. S. Seaton, a thoroughly practical man of twenty years' experience. Fig. 1 shows the "A" machine. It is a bolt header, making square, hexagon, T, and other heads—all perfect and uniform. The machine is very strong and compact; the movements are simple and positive, and the range of work is from ¼ inch to 1¼ inch diameter. The "B" machine (Fig. 2) is a track bolt header. It has a capacity of from two to five tons in ten hours, according to heating capacity. It is especially adapted for heading carriage bolts or rivets. The "C" machine (Fig. 3) is a rivet and bolt header combined, for the use of bridge, ship and car builders. It is very powerful, heavy and compact. Two fly-wheels make this a perfectly balanced and powerful machine and give the privilege of two speeds. It has a range of from ⅜ inch to 1½ inch diameter, and it will make bolts and rivets of any length. Its capacity is from one to four tons in ten hours, and its weight is 8,000 pounds. This company also make an upsetter, specially designed for bridge builders. Its cylinder is ten-inch, with 17-inch stroke. Its dies are closed automatically with a holding pressure of 60 tons.

NEW PROCESS OF SOFTENING STEEL.

A new process of softening tool steel has recently been brought forward, and has attracted much attention because of the remarkable softness produced. By this process any of the ordinary steels, of the usual lengths and shapes, for making machine tools, punches and dies will, when treated, become so soft as to effect a most material saving in the cost of making the desired tool. After having been softened and cut to the required form, the steel is handled in precisely the same way as any of the well-known brands, such as Jessup or Black Diamond. It is claimed that the process, which is kept secret, affects in no way the chemical composition of the metal, but so alters its physical structure as to impart the qualities mentioned. A piece of Jessup steel, which had been softened by this method, was taken to the Stiles & Parker Press Co., who made a punch to cut a five-pointed star ⅞ inch in diameter and unusually sharp at the points. According to the instructions given, the punch was to be made and then tested by the Stiles & Parker people. In the making of this punch they saved about 20 per cent. in the cost, owing solely to the softness of the metal. After having cut it, they tempered it in the usual way in water. The punch was then forced through German silver 3-32 inch thick, and through wrought iron 3-16 inch thick, and as a final test was forced through metal which cut only a part of the star, thus giving an unbalanced pressure tending to bend the punch. It was given a series of tests, not only unusual, but which would not be tried except under like conditions where the manufacturer is instructed to give the tool the severest trial possible, and where, as is natural, he passes from one test to another more severe. The tool came out at the last as perfect as when it left the makers' hands.

According to this it seems evident that the process while softening the steel, at the same time so changes it that when tempered it possesses greater strength than the same quality of metal untreated. The process is particularly applicable to die-sinking, where the hub, being of softened steel, can be made in much less time, while the die, also being softened, can be sunk cold instead of hot, as is now the common practice, thus saving time and labor. The die is then tempered and hardened in the usual way. It is claimed that this process changes what we might name the final quality of the metal so that its strength in high grades is increased at least 25 per cent. In handling the steel during the making of any tool it is absolutely necessary to perform all the operations cold, as the heating of the metal destroys the qualities imparted to it in the softening process. After having been treated the steel can be forged cold, can be twisted or bent in a way it would not stand before treatment, and can finally be tempered as desired. Any of the well-known brands of tool steel can be subjected to this process, and can afterward be treated in the usual way.—[Iron Age.

WITH Hon. Abram S. Hewitt studying the basic steel trade of Europe with a view to the establishment of this industry in the South, and telling the English iron makers that this section is to be the center of the world's iron and steel trade, and with the members of the English Iron & Steel Association preparing to visit the iron districts of Alabama and Tennessee this Summer, the prospects are favorable for this section receiving a great deal of public attention.—[Manufacturers' Record.

THE tunnel under the Hudson, at New York, is to be 5,600 feet long.

INDUSTRIAL SUMMARY.

New Enterprises :—

IRON AND STEEL.

The new steel company at Reading, which is to use the rail plant of the Philadelphia & Reading Railroad Co., is to be known as the Carpenter Steel Co., Mr. J. H. Carpenter, of New York, being its principal member.

The Virginia, Tennessee & Carolina Iron & Steel Co., incorporated at Goodson, Va., two years ago, have filed a charter at Richmond. The capital stock is $4,000,000. Offices are to be at Goodson, Pineville, Ky., Cranberry, N. C., and Jersey City, N. J. F. W. Huidekoper, of Washington, D. C., is president.

A charter has been issued to the Logan & Strobridge Iron Co., of New Brighton, Beaver County, Pa. The capital is $75,000, and the incorporators are: John H. Logan, Allegheny City; Turner Strobridge, Big Beaver Township; Charles C. Robinson, L. Roggen Strobridge and Persifer D. Hall, New Brighton.

A charter was issued on the 23d of May to the Bates Steel Co., of Philadelphia, with a capital of $100,000. The incorporators were John F. Bickle, of Morton, Pa.; Lewis Wiener, Augustus Hunt, Edward P. Kershow and F. G. Bates, of Philadelphia; Isaac L. Miller and William H. Miller, of Media; and Barton Pardee, of Lock Haven.

The Kittanning *Times* states that a company of Pittsburgh capitalists has purchased the old Rough Run Furnace with 1,500 acres of land and two new gas wells, and will build ore furnaces, glass works, etc., on the site just as soon as they can get the branch railroad, which was quite recently surveyed and run directly to the Rough Run, completed.

The Glenmore Iron Co. will erect a large plant on the Glenmore estate, three miles from White Sulphur Springs, W. Va. They have acquired 3,000 acres of land, upon which there is a vein of iron ore, from forty to sixty feet thick, and six miles long, which can be mined by open cutting. The Chesapeake & Ohio Railroad will run a branch line to the works and mines.

A Findlay, O., dispatch, June 4, says: The great plant of the Kellogg Seamless Tube Co. was to-day set in operation in this city with a large force of men testing the new process of making seamless tube. The process, which was to-day proven a grand success, will revolutionize the tube business. So well is the company satisfied, that an increase in their capacity has already been ordered. Hon. Howes Norris, of Boston, Hon. Benjamin Butterworth and Powell Crosby, of Cincinnati, are leading stockholders in the concern.

MACHINERY.

The Allentown Hardware Co. have been chartered at Allentown, Pa.

W. B. Snead & Co. have contracted to build new machine shops at Lynchburg, Va.

The Gracy Lubricating & Machinery Co., of St. Louis, has filed articles of incorporation, with a capital stock of $25,000.

W. A. Chesterman, of Richmond, has been awarded a contract to build an addition to the machine shops of the Richmond & Allegheny, in Richmond.

Enlargements, Additions, etc.:—

The Stewart Boiler Works, Worcester, Mass., has purchased land upon which to build new shops.

The Richmond & Allegheny is building a round house and machine shop at Gladstone, Va., which will be completed by July 1.

The Simmonds Rolling Machine Co., of Fitchburg, Mass., has increased its capital stock from $400,000 to $600,000.

Armstrong Bros., of Springfield, Ohio, will, it is reported, move one of their machine shops, valued at $75,000, to Florence, Ala., later in the year.

It is stated that Mr. John Gubbins, proprietor of the Excelsior Machine Works, Chicago, is about to build a boiler shop 40x100 feet. The locality selected is No. 3 Mather St.

A little over a year ago the Reliance Gauge Co., of Cleveland, O., leased a three-story block in which to manufacture their Reliance safety water columns. This was expected, when leased, to be ample for the business for at least five years. Some idea of the way it is growing may be had from the fact that they are already putting up an addition to the block.

The Newport News & Mississippi Valley Co. is now building new shops at Memphis, Tenn. The buildings include machine and car shops and a round-house. It is also enlarging the old yard and building a new one. The work is to be completed by September. The company has bought 1,600 acres of land at Clifton Forge, Va., and it is said will build large machine shops there.

Messrs. G. A. Crosby & Co., Chicago, manufacturers of presses, dies and special machinery, inform us that they are now occupying their new building, located at 176 and 178 South Clinton St., between Adams and Jackson, one block West of "Union Depot." They have made the change in their location to meet the rapid increase in their business, and have greatly enlarged their plant by the addition of the most modern machinery especially adapted to their work. The principal features of their new building are, that it is a strong, substantial, three-story building, with pressed brick and iron front with stone trimmings. It is 40 by 140 feet and has fine light on three sides. In the rear is their blacksmith and forging shop, 20 by 40.

Fires and Accidents :—

Erie (Pa.) Malleable Iron Co., Limited, May 30; entire plant.

At New York, May 26, No. 81 John street, occupied by the Pittsburgh Tube Co. and others. Loss $10,000 on stock, and $300 on building.

About 200 feet of the Cleveland Rolling Mill Co.'s brick wire works (annealing department) fell with a crash, last Thursday; loss, $5,000.

Failures, Shut-downs and Wage Matters:—

The assignment of Lewis Passmore, of Philadelphia, trading as the Glenmore Foundry, which was for the benefit of all the creditors, was recorded last week. J. W. Shimer, of the firm of L. & R. Wister, is named as the assignee. The amount of assets or liabilities is not known, but it is said by interested parties that the firm will be able to pay dollar for dollar.

Some Pittsburgh rolling mills are considering a 10 per cent. cut.

The Danville (Pa.) rolling mills have abandoned their offer of $3.25 per ton for boiling, and are now paying the old rate, $3.60.

After a continuous run of 14 months, the National Furnace, at De Pere, Wis., was blown out on the 18th ult. During the last two weeks of its run the furnace produced 939 tons of pig iron.

Sharon Furnace, at Sharon, Pa., operated under lease by Spearman, Collord & Co., was blown out last week. It has been turning out about 75 tons of metal per day. The lease expires in July next, and although the lessees have the privilege of renewing it at present terms, it is thought that they will not do it. The furnace is owned by Boyce, Rawle & Co., of Sharon, Pa.

Owing to the depression in the iron market, and in view of the vast amount of iron now in stock at their various furnaces in the valley, the Columbus & Hocking Coal & Iron Co. shut down on the 23d ult. their Winona and Buchtel furnaces indefinitely. This leaves the Bessie, at New Straitsville, and the Hattie, at Greendale, the only furnaces now in blast in the valley. Four hundred men are thrown out of employment.

Works Starting Up:—

Lucy Furnace (charcoal), at Mount Union, Pa., has recently been thoroughly repaired and improved, and will be started up in a few weeks under the management of John Whitehead, the owner of the furnace.

The plant of the Oil City Tube Co., at Oil City, Pa., which has been running single turn for some time, was put on double turn last week. The report that a strike had recently occurred at the works is without foundation.

General Industrial Notes :—

Messrs. George H. Hull & Co., pig iron merchants, of Louisville, Ky., and St. Louis, Mo., have established an office at No. 71 Broadway, New York, Mr. Jared M. B. Reis being manager.

Mr. S. J. Law, formerly with Fairbanks & Co., has accepted a position with the Oil Well Supply Co., of Pittsburgh, and is looking after the trade for this firm throughout the gas belt territory of Ohio and Indiana.

The Ætna Machine Co., Warren, O., on last Wednesday, received an order from the Youngstown Bridge Co., Youngstown, O., for an engine to drive the machinery in the bridge works they are now building at Hazelton.

The following is the report of Fayette Brown, receiver of Brown, Bonnell & Co., of Youngstown, for April, 1889: Balance on hand, April 1, $6,729.93; receipts in April, $228,720.31; total, $235,450.24; disbursements in April, $229,722.93; balance on hand April 30, $5,727.31.

The Laidlaw & Dunn Co. have received the contract for the entire pumping outfit to supply the United States Barracks, at Newport, Ky. This outfit is located at the new reservoirs of the Covington Water Works. This concern is doing a large business in their standard "Duplex" pumps.

Sealed proposals will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until 2 o'clock P. M., on the 12th day of June, for furnishing and putting in place, complete, in the post office, court house, etc., at Syracuse, N. Y., one hydraulic passenger elevator.

The Phœnix Iron Works (W. H. Thompson, proprietor), Cleveland, O., have been engaged since January 1st on outfit of cranes and machinery for the Anniston (Ala.) Pipe Works. The order includes about twenty-five cranes, ranging in capacity from five to thirty tons each, and will aggregate near $100,000. This, in addition to numerous other orders accepted and under way, has necessitated double time. Mr. Thompson has also lately shipped a 5-ton traveling crane to the Volk & Murdock Iron Works, Charleston, S. C., and a 10-ton pivot crane to the American Bridge & Iron Co., Roanoke, Va.

Hulet, Holmes & Co., Berea, O., manufacturers of pick handles of all sizes, have lately placed on the market a new and improved clothes bar, called the "Eclipse," which has great merits. Its construction is simple and durable, and wherever it has been used it has given the best of satisfaction. The pick handles made by this firm are all from the best selected second-growth of hickory, and for beauty and finish cannot be excelled. The company also manufactures neck-yokes. The material used is the best second-growth ash. We call attention to the trade on the specialties manufactured by this company.

The Bucyrus Foundry & Machine Co., of Bucyrus, O., have been established the past eight years, and have steadily increased their business, so that at the present time they are employing 150 hands. Their specialties are steam dredges and steam shovels. The products of this company are shipped all over the Union. They also have a good foreign trade. This year's trade shows a slight increase over last year's, and the company report the prospects for this season very good. The officers are: Col. W. H. Harris, president; Howard B. Hills, vice-president and treasurer; W. B. Crittenden, manager; A. B. Stetson, superintendent; A. W. Robinson, assistant superintendent.

The American Nail Machine & Manufacturing Co., formerly of Ashtabula, O., have lately moved into their new and commodious plant at Findlay, O. The buildings of this company are all built of stone; dimensions of the main building, 290x50; foundry, 50x80. This company manufactures the well-known American nail machine, and the American high-speed engine. This engine is especially adapted for electric power plants, where high speed and power are a necessity. This company has splendid shipping facilities, being connected with switches to three different railroads. The officers of the company are as follows: P. F. Good, president; John A. Scott, vice-president; A. W. Call, secretary.

"IT is astonishing what one moderately productive well will do when the gas is properly handled. In the State of Indiana, the town of Portland, which has 2,000 inhabitants and several manufactories, is supplied from one well, with a capacity of 875,000 feet daily, and one mill there with an engine uses 20,000 feet each day."

METHODS OF USING AERATED FUEL.

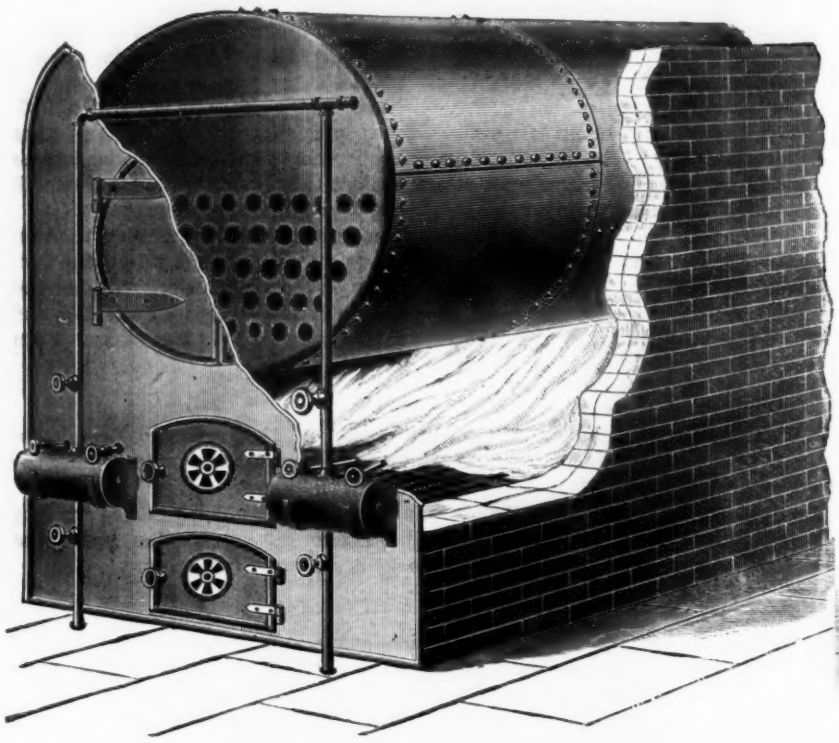

FIG. 1.

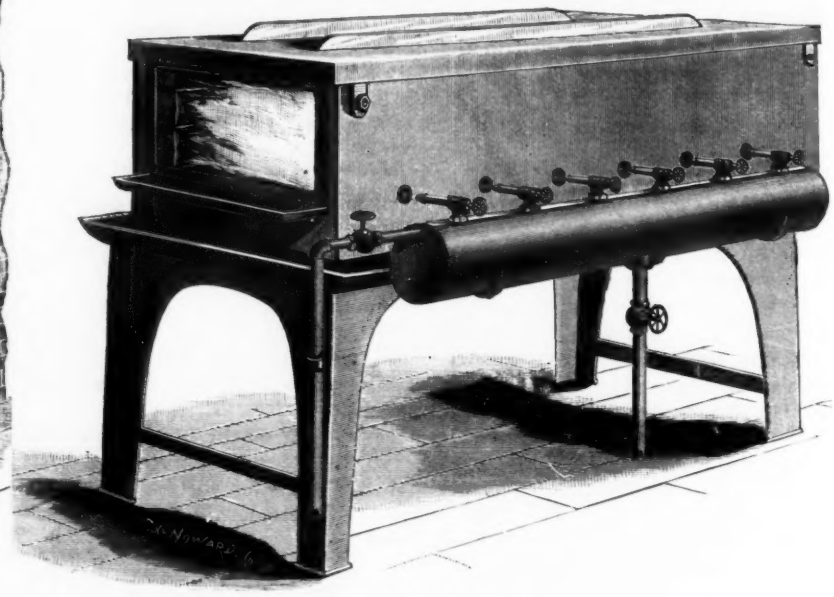

FIG. 3.

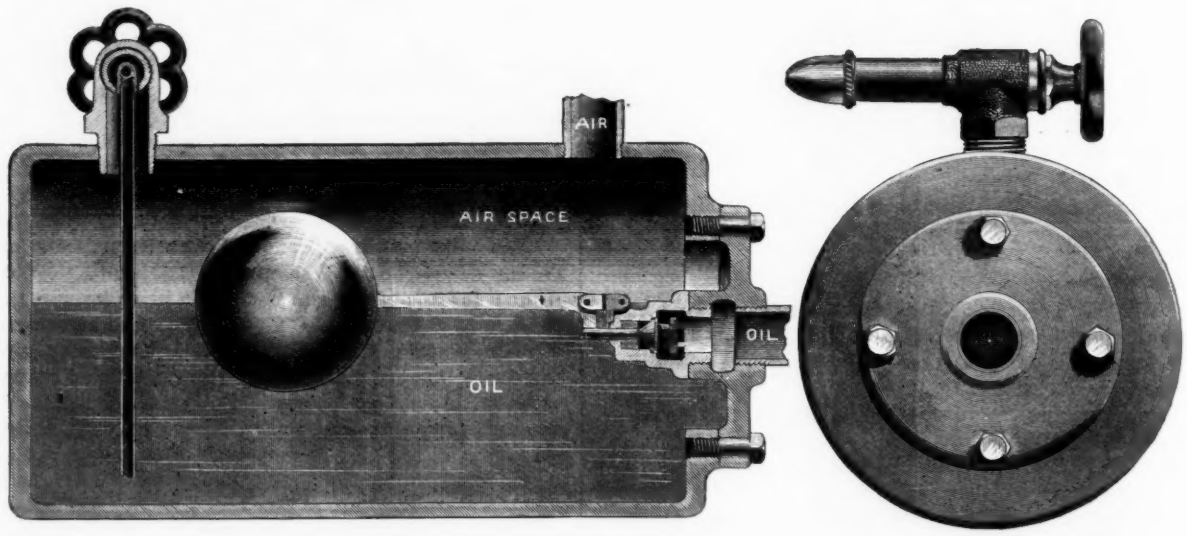

FIG. 4.

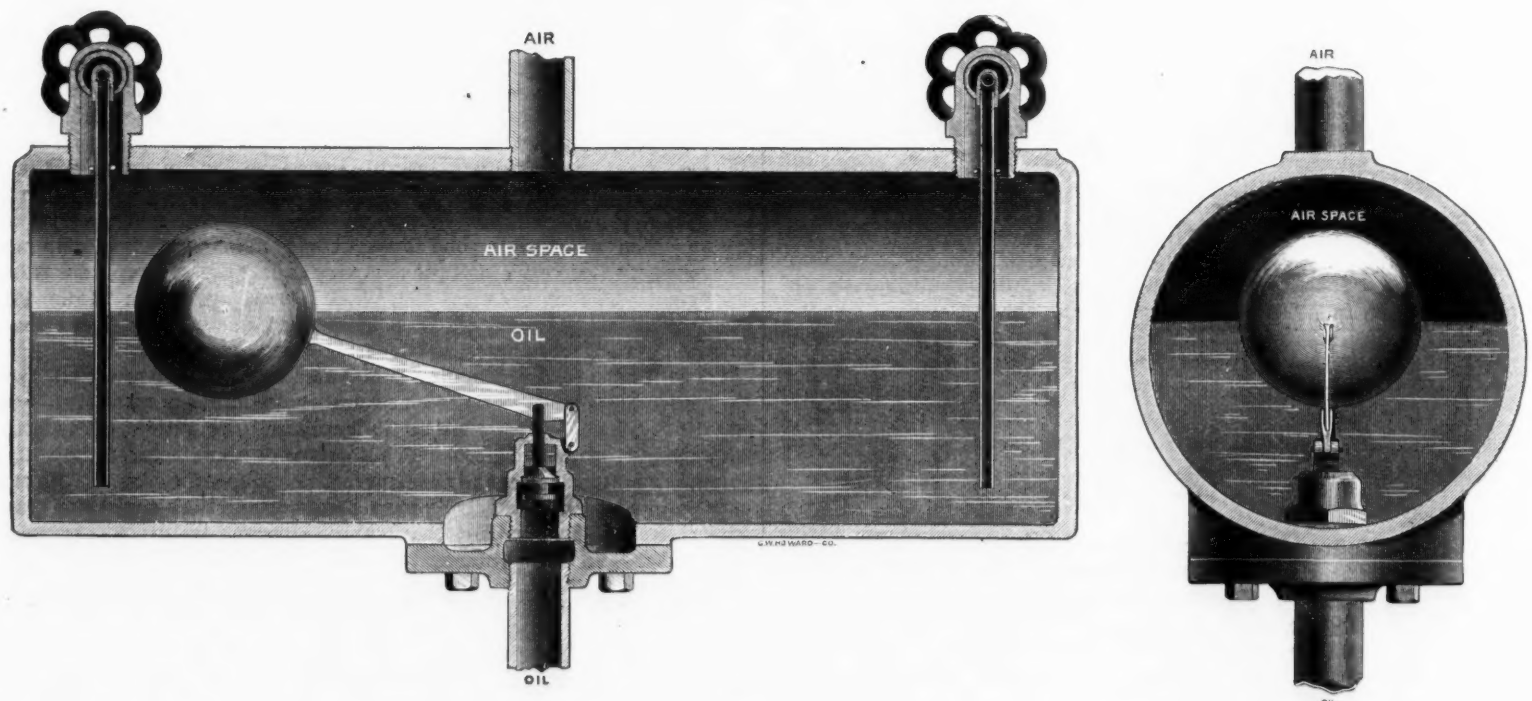

FIG. 5.

AERATED FUEL.

Just at present the all-important subject under consideration by the manufacturers in this country is economy in fuel. None are more deeply interested in this subject than iron workers. Natural gas has a certain claim to economy in the gas regions, a limited area of the entire United States. Coal has a right to be classed as a cheap fuel in many places, yet all of our manufacturers cannot locate in just these particular places nor can they sacrifice their costly plants in order to move to the coal, gas or iron regions. The next thing for them to consider is how to bring cheaper fuel to their own locality. Transferring, handling and storing coal is an expensive operation. Natural gas cannot be supplied at a very great distance from the well, but crude oil can be transported at a very slight cost to most any part of this country, hence manufacturers are interested in this particular portion of the fuel question referred to above. It has been our privilege lately to inspect the method employed by the Aerated Fuel Co., of Springfield, Mass., in burning crude or fuel oil, and herewith give illustrations of same, and a statement of what we saw and heard, thinking it will prove interesting to our readers.

Fig. 1 shows the application of this system under a return flue boiler, which has been used by the Boston & Albany over 20 months, and the Aerated Fuel Co. are now fitting up the electric light and heating plant connected with the Boston & Albany's new $2,000,000 depot in Springfield, Mass. Among the many advantages claimed by this system over coal are: Uniform heat, constant pressure of steam, no ashes, clinkers, soot or smoke, and, consequently,clean flues; one man attending from 10 to 15 100 horse-power boilers, burning this fuel easier and with less trouble than one boiler burning coal.

Fig. 2 shows the application of this system under forge fires, showing a portion of one side of the Upson Nut Co.'s plant, Cleveland, O., (where 130 burners are in operation) used for forging nuts and bolts. On all work of this kind not only does the oil cost from 40 to 80 per cent. less that coal, but the dies wear longer, there being less scale on the work. The heat is uniform and can be maintained from morning until night without any cessation, enabling the workmen to do more and better work. The whole system permits the storage of all the oil below the burners, thereby meeting the requirements of the insurance companies. The location of the oil storage tank is shown in the cut, and all the oil pipes are on or below the floor line.

Fig. 3 shows this system as applied to a forge suitable to do a large variety of general work. One cylinder containing six burners is placed on one side only, leaving one end open to receive the work. If desirable, both ends may be left open, especially when you have to heat long pieces of iron or steel in the center, like railroad frogs, guides, etc., or bridge girders or trusses. By using an adjustable or movable brick partition in the furnace you can shut off as many of the burners as are not required for the work being done. We saw this style of forge in operation at the Boston & Albany repair shops in Springfield, Mass., where this system is generally employed, and was informed by the superintendent that he regarded this as far superior to coal in every respect, particularly for work requiring a high degree of heat at short notice.

Fig. 4 illustrates the interior and an end view of the burner cylinder, showing the proper position of governing float valve when cap is on the end of the cylinder.

Fig. 5 shows the proper position of valve, etc., when cap is in the center or underside of cylinder.

The object of this float is to prevent the flowing of oil into the cylinder and rising above the mean level as established by the governing device in each cylinder. This prevents flooding in any manner, and is an important safety device that is highly commended by insurance companies. When the oil is being burned and falls below the mean level, this float drops of its own weight so as to open the valve shown at the end of float arm (Figs. 4 and 5) permitting oil to flow in until the mean level is reached, at which height the float closes the valve again. The sectional cuts also show that if from any cause the float should sink, the valve would also be closed and prevent the flowing of oil just in the manner as described above. This device effectually prevents any possibility of flooding the furnace or overflow in the tanks.

The proprietor of one large manufacturing company says that he "considers that the money he spent in the purchase of the oil apparatus furnished by the Aerated Fuel Co., of Springfield, Mass., the best investment he ever made." His help claim they do more and better work, and earn more money than with coal fires. He also says the trade like the finish of his goods better than when worked in coal, the reason of which seems to be that the oil flame does not scale as the coal does. Another manufacturer says: "I had but one trouble with this oil, and that was when I first got it in running order. The insurance companies 'kicked,' as the saying goes, claiming the process was not safe, and I just took them and showed them wherein the safety was and prominent features in the process. They kept strict watch for a long time, but could not find one bit of fault with what the Aerated Fuel Co. have done. They have made a study of this insurance business and all its requirements in a manner satisfactory to the insurance people." We were then shown the forge department, and describe the process as follows:

This system is first-class in regard to safety, and, when put in like our plant, meets with the requirements of all first-class insurance companies, in fact, the Home Insurance Co. say that this is so, and when you satisfy that company, you are doing pretty near the right thing. You see our tanks are out of doors, underground (see cut No. 2, "Upson Nut Co."), the oil is drawn from them into a small cylinder attached to and directly under the oil pump. This cylinder is provided with a float valve which controls the height of oil, the glass sight-gauge showing at all times the exact height of oil all through the factory, and if one or more workmen should put out their fires simultaneously, this float would stop the pump, and only permit its working again after the oil had fallen below the regulated level. Thus, you see, all the oil there is in the factory at any time amounts to only a few gallons, and by opening a valve in the oil pipe on the floor near the outside wall, all the oil in the pipes, etc., can run back into the main tank out doors, thereby adding another safeguard. Then again, suppose an accident happened in your factory, the engineer or anyone by stopping the air compressor puts out instantly every forge and other fire connected with this system in the building. On the burner cylinders there is an angle valve to govern the exact amount of oil to be admitted to the cylinder. Suppose that this valve refuses to work, or is left wide open by an operative, and that the large float does not do its duty, which is not at all likely, still we will suppose such a case. We are still protected by another and positively automatic shut-off (cut No. 4 cylinder cut open) valve right inside of each burner cylinder which will not allow the oil to get above the level you now see in the glass sight-gauge on the other end of this burner cylinder, and here you have safety again. If a fire should occur in a building where coal was being used, the workmen rush out and leave the factory on the first alarm of fire and also leave in a forge of 40 fires, each with 100 or 200 lbs. red hot coals, about 6,000 lbs. in all, that cannot be extinguished, and when the floor overhead falls, these hot coals add just so much fury to the flames. With oil fires the workmen leave them burning and rush out of the building. There are two ways to stop every fire at once, and not go near them. One by stopping the air compressor, and the other by shutting off the oil at the tank outside the building. The oil left in the building would amount to only a few gallons. All these precautions have been taken by the Aerated Fuel Co., and put in operation by them at their own suggestions, so as not only to comply with the insurance regulations, but also to have the best system there is.

The air compressor is controlled by a governing device that is so sensitive that as each fire is stopped this automatic governor gradually shuts off steam in the steam cylinder, so that if all the fires are shut off entirely the air compressor is at a standstill, and will not move until the fires are started up again.

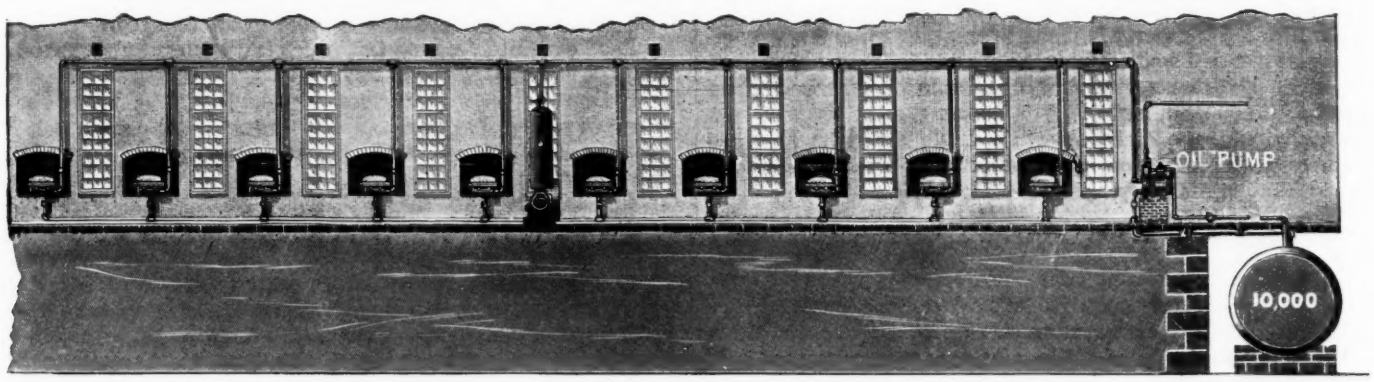

FIG. 2.—APPLICATION OF AERATED FUEL TO FORGE FIRES.

American Machinery Exhibits at Paris.

The American machinery exhibit at the Paris exposition occupies one-third of the entire space in the big Machinery Palace, which is nearly 1,400 feet long, 370 feet wide and 170 feet high. That electricity constitutes an absorbing problem of mechanical invention and physical discovery is shown by the prominence its apparatus occupies. Throughout Machinery Hall and in various other parts of the exhibition there are 500 exhibitors in this branch. The universality of the study devoted to it is shown in the range of the countries represented by apparatus. These countries include France, Germany, Great Britain, America, Belgium, Switzerland, Algeria, Austria, Hungary, Chili, Denmark, Spain, Italy, Japan, Norway, Portugal, Russia and Finland.

The Edison exhibit occupies one-half of the entire American frontage, covering 9,000 square feet. It is the largest single exhibit in the Exposition. It is devised to illustrate in miniature most of the great practical results of Mr. Edison's inventions. His entire category of inventions, numbering 493, is presented either completely or by intelligible suggestion. The phonograph and the American writing machines are the popular delight of the Exposition. Every nation will find one of the phonographs speaking its own tongue, a sufficient number of machines being suitably equipped for the performance of this marvel.

THE Aurora Nail Works, of Aurora, Ind., one of the largest manufactories in the State, has contracted to remove to Marion, same State, to secure free gas. The factory expects to employ 500 men.

AMONG THE IRON MINES.

Gogebic Range:—

M. E. Harrington & Son have taken a contract to do considerable diamond drilling at the Volunteer mine. They are experienced men, and will be a valuable acquisition to the prospecting force of the mine.—[Iron Ore.

The work of prospecting on Section 33, just northwest of this city, is progressing favorably. The vein has widened from 6 to 36 inches, and the quartz shows free gold quite plentifully—enough to please all who have an interest in the property. An assay made by Mr. Mintz gave $41.25 in gold, while one by Mr. Uddenberg gave $43, $2 of which was silver. The prospect starts out well, the vein is evidently a true fissure, and the hopes that are entertained for its richness and permanency, seem to have splendid grounds for realization.—[Iron Ore.

A find of hard hematite ore is reported in the south drift of the East New York mine, from the 150-foot level. Samples of the ore show it to be of great richness, and a Bessemer. In the drift to the north thirty-three feet of ore has been cut without yet passing through the body. It looks well, does the East New York, and no mistake.—[Iron Ore.

Shipments from the West Cary and Cary, which are practically one mine, have been increased somewhat this week, sending out about 400 tons each 24 hours. The stock piles are about cleaned up, and a more vigorous underground development will be commenced in the way of sinking and opening up new ground. These mines will make a very fair record this season, and are finely equipped with machinery for so doing.—[Pick and Axe.

The shaft at the Atlantic has reached a depth of 190 feet, and the work of cross-cutting is now being done, both to the south and north. In the north cross-cut a good showing of ore has been struck the present week, and the same will probably prove that the ore body lies in that direction. The property will be developed throughout the season under the management of Mr. Shafner, of the Iron Belt.—[Pick and Axe.

At the Sparta, formerly the Chicago, work is progressing finely. The new shaft is now down 115 feet and is looking very good. They are at present working in a banded formation of slaty jasper-like rock, and they will keep going down. Considerable trouble has been had with the water, which is keeping a No. 6 Knowles busy. A new boiler is being placed in position, as the old one was found to be too small to make steam for both hoist and pump. Capt. McLeod, who is in charge, has considerable faith in the future of the property.—[Iron Spirit.

The shaft at the Kingman property is down nearly 70 feet, and the company has put in a small but well built duplex hoist and fire box boiler, and intend to keep at work. Quite a large amount of money has been expended on this property, but the management had failed to locate themselves until the present shaft was sunk, under the direction of Capt. McLeod, who now has charge of the property, and there is now no doubt but that ore will be found within a short time if it exists on the property.—[Iron Spirit.

Menominee Range:—

The main working shaft at the Millie mine is being provided with a shaft house and cage for hoisting the ore instead of the old-fashioned bucket that is now used. A new hoisting plant, compressing air engine, 16 by 24, and three 4-foot drums, is also being put in. The Millie continues to improve, and will ship more ore this season than in any previous season.—[Menominee Range.

Six test pits were started on the Hamilton property yesterday for the purpose of locating the new shaft, which will be started at once when this point is settled. Supt. Jones hopes to strike a dry ledge at one of these points, and thus avoid the difficulty of sinking a shaft through quicksand. Having located their shaft it will be pushed forward as rapidly as possible by raising and sinking, until complete. It will be connected with the present shaft by drift at 1,300 feet. This practically ends the possibility of negotiations with the Lumbermen's Mining Co. for connecting the Hamilton shaft with the Ludington A shaft, because with a second shaft on the Hamilton property, the necessity for any such connection will cease.—[Range.

Mine Inspector Knight and the editor of this paper were piloted through the Hamilton mine by Capt. Carbis last Saturday afternoon. Since the writer was in the shaft, about two years ago or more, the shaft has been sunk about 500 feet, and is now 1,270 feet deep. At a depth of 1,125 feet, a cross-cut was driven 40 feet in clean ore, and shows a breast of the same material. From this point a horseshoe bend is made around a block of ground that is left for a pillar to support the shaft, and a drift 70 feet long has been driven east, which also shows a clean breast of ore. A winze is being sunk in the end of this drift which is now down about 20 feet. The bottom of the shaft is now entering the foot-wall, and the material taken from there is mixed with rock, and will soon be valueless as a product of the mine. At a depth of 900 feet a large room has been blasted out, and a powerful Worthington pump is stationed in it to pump the water from this level to the surface. Steam is used as a motive power to run the pump, which makes this room very hot and dry, the temperature ranging from 110 to 120 degrees.—[Range.

Marquette Range:—

The Jackson Iron Co. are doing some exploratory work with a diamond drill, on the north side of Teal Lake. Work was commenced in the ravine near the residence of Mr. Sundberg last week.—[Negaunee Herald.

On the East Negaunee range work is being pushed at the Negaunee, Buffalo, South Buffalo, Boston, Queen and Prince of Wales. The combined output will cut quite a figure in the shipments of the Marquette district.—[Negaunee Herald.

Joseph Kirkpatrick is exploring for the Pittsburgh & Lake Superior Iron Co. near the Volunteer mine. Ore is known to exist there, and a new mine may be looked for in that district. Mr. Wm. Kirkpatrick, a former resident of this county, who has been at Sharpsville, Pa., for several years, will assume charge of the operations, it being the intention of Joseph Kirkpatrick, Sr., to go to Europe this Summer.—[Negaunee Herald.

The Marquette *Mining Journal* was shown some very fine specimens of iron ore recently which were taken from a test pit being sunk on a tract, some 15 miles southwest of Republic, on which Mr. D. H. Ball, of this city, is conducting explorations under an option from the Michigan Land & Iron Co. The tract is described as the northeast quarter of the southwest quarter of section 21, 45-31. The pit is down about 18 feet, and the ore was encountered at this depth. It appears to be an outcrop. At the depth stated there is three feet of ore, similar in structure and appearance to the Republic ore, and it is thought that a workable body will be found in place at greater depth. The trend of the formation here is east and west. A small force is at work on the property, under direction of a competent mining man, and the work of testing the tract is being systematically prosecuted with encouraging promise of good results. Wm. J. Stevens, of this city, holds an option on the northwest quarter of section 22, in the immediate vicinity of the Ball option, and will thoroughly explore the tract this season.

General Lake Superior Mining Notes:—

[SPECIAL CORRESPONDENCE OF THE IRON TRADE REVIEW.]

ISHPEMING, MICH., June 4.—Most of the mines of this (Marquette) district will this season pursue the policy of mining and shipping as much ore as they can get out without crowding the mines too hard. The effect of this will certainly be to keep the price of ore low, and from the present indications the ore production of the Lake Superior field for the present year will not fall below 5,500,000 tons, and will very likely reach 6,000,000 tons, as against 5,023,279 tons mined and shipped in 1888. Where the extra ore will go is a problem.

Southern iron makers are getting rates on ore freights from Ishpeming to Bessemer, Ala., and other points in the Birmingham district. The best figure so far obtained has been little less than $6.00. Whether Southern iron makers can use any lake Superior ores for mixing with native ores in furnace with such a high freight rate, is a point that can be settled only by trial. The experiment looks a trifle doubtful.

The management of the East New York mine, of this city, expects to ship 50,000 tons of ore this year. A recent find of Bessemer ore is reported from this property, on the 150-foot level.

The American mine, seven miles west of Ishpeming, made a sale of 20,000 tons of ore to Carnegie, Phipps & Co., a few days ago. The mine will ship about thirty-five to forty thousand tons of ore this year.

The Lake Superior Iron Co., which is a wealthy but extremely conservative company, will probably ship less ore this year than last. The prices realized for ore are not satisfactory, and the company prefers having its ore in the ground to selling it at an unsatisfactory price. This mine has produced over 4,500,000 tons of ore, and were the management to push the work of development and mining, the Lake Superior could produce five or six hundred thousand tons annually.

The new "lake shaft" of the Cleveland mine will be a heavy producer next season. The surface improvements are on a scale that leads to the belief that this shaft will shortly become the principal part of the mine. It is an "open secret" that nearly two-thirds of the ore produced by the Cleveland is mined at a margin of only a few cents a ton. The profit earned comes from the other third. The old workings of the Cleveland are growing deep and hard to work.

The city of Ishpeming has decided to change its source of water supply from Lake Angeline to Lake Sally. Lake Angeline will be pumped dry, and the Cleveland, Lake Angeline and Lake Superior iron companies will mine ore from beneath the bed of the dried-up lake. The citizens will get better drinking water, and the mines will get valuable ore deposits by the change.

The Volunteer (recently Pittsburgh & Lake Superior) mine, Gen. Alger's recent acquisition, will do a large amount of exploring with diamond drills. The Pittsburgh & Lake Superior Iron Co., which is principally owned by Ralph Bagaley, of Pittsburgh, and J. C. Kirkpatrick, of Negaunee, will do some exploring with diamond drills, near the Volunteer, this season.

The Beaufort mine, in Baraga county, at the extreme western end of the Marquette range, will ship 10,000 tons of ore this year, the amount that royalty must be paid on. The Titan, adjoining the Beaufort, is not working, and probably will not work this season. HORACE J. STEVENS.

Opening up Southern Ore Lands:—

Large areas of valuable ore lands are being quietly picked up throughout the Southern states, particularly in locations that are being developed, or likely to be developed, by railroad construction in progress and in contemplation. The recent victories of Southern crude iron makers in Northern markets are indications of further victories in finished iron branches, in which, so far, very little progress has been made. Vast coal areas are also being secured. Coke plants are being put up. Several rolling mills are projected, besides a number of establishments for the manufacture of equipments for railroads. The advantages of Southern iron makers are attracting more and more attention, and the next general expansion of demand, which cannot be now long delayed, will stimulate iron making South of the Ohio on a grander scale than ever.—[Railway Review.

Iron Ore of Remarkable Purity:—

The new iron ore bed at Mineville, Essex County, N. Y., operated by Messrs. Witherbees, Sherman & Co., has lately been producing, from numerous openings, iron ore of such remarkable purity as to be a wonder, even to those familiar with that unique deposit of Bessemer iron ore. A sample taken so as to represent the average of a pile of about 400 tons was submitted to the company's chemist, T. R. Woodbridge, who found that it contained 72 per cent. of iron and 0.018 per cent. of phosphorus. Similar pockets of such ore

have occasionally been found in the new bed, and from these pockets are often obtained unique crystals of magnetite, some of them 2 inches or more on the face. In the company's office at the mines is a perfect octahedral crystal, 1½ inches on the face, which can be readily lifted from its pocket of granular ore. —[Iron Age.

Rich Iron Mines in Oklahoma:—

Dispatches from Oklahoma report the finding of rich iron mines a short distance from Guthrie. The ore is said to be very fine and probably contains 65 per cent. of iron. A shaft will be sunk at once and thorough examination of the deposit made.

Lake Superior Shipments of Iron Ore:—

Shipments of iron ore from the mines of Lake Superior for the season of 1889, up to Wednesday, May 29th, are as shown by the appended statement, condensed from the Marquette *Mining Journal:*

MARQUETTE RANGE.

American	4,668	Hall	8,603	Prout	1,237
Barnum	918	Humboldt	2,578	Queen	6,581
Braastad	23,799	Jackson	17,569	Republic	68,723
Buffalo	5,851	Jackson, pit 7	2,412	Republic Reduction Co.	8,070
Buffalo, South	2,205	Lake Superior	3,399	Salisbury	2,970
Cambria	16,292	Lillie	5,479	Salisbury Bessemer	3,229
Champion	45,587	Lucy	1,309	South Buffalo	8,948
Cleveland	30,640	Marquette	8,008	Superior	13,437
Cleveland, Hematite	12,136	Michigamme	4,281	Superior, Hematite	15,041
Cliffs shaft	28,613	Milwaukee	8,439	Volunteer	4,633
Curry	2,798	Negaunee	15,549	Webster	117
Detroit	2,087	North Champion	1,118	Winthrop	13,190
East New York	1,364	Pitts. & L. Angeline	43,758		
Total, Marquette Range					445,819

MENOMINEE RANGE.

Armenia	6,712	Great Western	7,282	Norway	18,672
Chapin	108,229	Hamilton	2,921	Paint River	2,247
Commonwealth	18,269	Iron River	27,333	Perkins	2,118
Crescent	6,050	Ludington	14,830	Vulcan	39,275
Cyclops	7,750	Mastodon	11,416	Walpole	1,211
Dunn	24,093	Millie	1,272		
Florence	31,117	Monitor	1,749		
Total, Menominee Range					332,546

GOGEBIC RANGE.

Anvil	5,545	Cary West	1,232	Pabst	19,919
Ashland	30,656	Germania	18,951	Pence	15,959
Aurora	25,426	Iron Belt	7,478	Section 33 south	5,707
Beaver	4,607	Iron King	6,481	Sellwood Colby	1,584
Brotherton	11,508	Norrie	102,099	South Colby	11,811
Cary	3,074	North Montreal	5,760	Windsor	4,272
Total, Gogebic Range					282,166

VERMILION RANGE.

Minnesota Iron Co.		69,567	Chandler Mine		40,757
Total, Vermilion Range					110,324
Grand Total					1,170,858

Vital Statistics and the Federal Census.

We print the following by special request from the Census Office:

DEPARTMENT OF THE INTERIOR,
CENSUS OFFICE,
WASHINGTON, D. C., May 1, 1889.

To the Medical Profession:

The various medical associations and the medical profession will be glad to learn that Dr. John S. Billings, Surgeon U. S. Army, has consented to take charge of the Report on Mortality and Vital Statistics of the United States as returned by the Eleventh Census.

As the United States has no system of registration of vital statistics, such as is relied upon by other civilized nations for the purpose of ascertaining the actual movement of population, our census affords the only opportunity of obtaining near an approximate estimate of the birth and death rates of much the larger part of the country, which is entirely unprovided with any satisfactory system of State and municipal registration.

In view of this, the Census Office, during the month of May this year, will issue to the medical profession throughout the country "Physician's Registers," for the purpose of obtaining more accurate returns of deaths than it is possible for the enumerators to make. It is earnestly hoped that physicians in every part of the country will co-operate with the Census Office in this important work. The record should be kept from June 1, 1889, to May 31, 1890. Nearly 26,000 of these registration books were filled up and returned to the office in 1880, and nearly all of them used for statistical purposes. It is hoped that double this number will be obtained for the Eleventh Census.

Physicians not receiving registers can obtain them by sending their names and addresses to the Census Office, and, with the register, an official envelope which requires no stamp will be provided for their return to Washington.

If all medical and surgical practitioners throughout the country will lend their aid, the mortality and vital statistics of the Eleventh Census will be more comprehensive and complete than they have ever been. Every physician should take a personal pride in having this report as full and accurate as it is possible to make it.

It is hereby promised that all information obtained through this source shall be held strictly confidential. ROBERT P. PORTER,
Superintendent of Census.

The Davis Platform Binder.

One of Cleveland's rapidly growing institutions is the Davis Platform Binding Co. The works are rushed with orders, and the prospects for the future are glowing. Of a recent test of the Davis binder in Texas, the Dallas *Times-Herald*, in the course of a long article, says: "The interest awakened is so general among this class of our readers that a *Times-Herald* reporter was sent out yesterday afternoon to the farm of Mr. Rush, about one and one-half miles west of Dallas, where the new candidate was found at work in a field of heavy wheat. Our representative found a large number of farmers and machine men watching the operations of the platform binder and an elevator binder in the same field, and the scene was truly a remarkable one. The elevator binder was drawn by two large mules and two medium-sized horses, and even this aggregation of muscular 'brawn' had to keep right down to business to get along with any degree of comfort. The platform binder, on the other hand, was pulled by two little Texas ponies, who walked along without any apparent discomfort and without 'sweating a hair.' The reporter, in company with a score or more of other spectators, followed the machine around the field a number of times, and there is no disputing the fact that it bound tighter, handled the grain better, cut a wider 'swath,' moved over the ground faster, and did nicer, smoother work in nearly every respect than the elevator binder. The spectators, as far as inquiry was made and opinions expressed, were unanimous in the verdict that the new machine was a perfect success and destined in the near future to seriously interfere with the business of the older concerns, from the fact that it can reasonably be expected to lessen the cost of harvesting grain fully one-half."

Transmission of Power by Vacuum.

London *Industries* says that the Popp Company, in Paris, for the distribution of compressed air for working clocks, and also for motive power purposes on a large scale, has a rival in a company which sells power by means of rarefied air. The works are situated in the Rue Beaubourg, and were established in 1885, and contain three steam-driven air-pumps, which produce in the network of distributing pipes converging at the station a vacuum of about 20 inches of mercury. The motors at the subscribers' premises are similar in construction to small steam engines, and work by reason of an excess of pressure of the atmosphere over that in the exhaust pipes. There are in all some 150 motors at work, varying in power from ½ horse-power to 2½ horse-power, and the greatest distance from the station 2,500 feet. One of the directors of the company has recently read a paper before the Paris Society of Civil Engineers, in which he gave the efficiency of these vacuum motors at 81 per cent.; but the system is obviously only applicable over small areas, and can, therefore, not compete with Popp system of compressed air distribution over large areas. An attempt to utilize rarefied air for working dynamos, and thus supply electricity from the station in the Rue Beaubourg, has failed, owing to the low efficiency of the system as a whole and the complications it entails. The company have, therefore, installed at their station dynamos and separate engines for the direct distribution of current, and this machinery is worked in the evening, whilst the vacuum pumps are worked during the day.

Steam Hammers vs. Forging Presses.

In his inaugural address, as President of the Iron & Steel Institute, Sir James Kitson says: "A reference to the steam hammer has a special interest at this moment, as it is a tool which appears to have reached its fullest development," and gives a list from Messrs. A. & C. Casolonga's memoir on steam hammers, of the heaviest hammers in Europe. England has one 30-ton hammer and one of 35 tons, double-acting. There is one 50-ton hammer in Germany and one in Russia of the same weight. In France there are two 100-ton, one 80-ton, one 50-ton, two 40-ton, one 35-ton, with three 25-ton and four 20-ton hammers, all double-acting. The reason for this array of steam hammers in France is that the French government has encouraged their construction by continuous contracts for heavy artillery.

The forging capacity of England is not represented by steam hammers, as hydraulic forging presses in the works of Whitworth, Vickers, Brown and Cammell do, it is claimed, superior work to that accomplished by hammers. Sir James Kitson reasons that the effort of the hammer is abrupt, and the force of the blow is absorbed to a great extent on the surface of the forging, and if the hammer is not up to its work piping is apt to result; with the press of 4,000 or 5,000 tons, however, the action is described as "silent, slow-working and irresistible," and it is held as certain, as the hammer cannot develop in its fall the full amount of energy stored up in raising it, that a press of less than 3,500 tons power would be equivalent to a 100-ton hammer.

Increase in Lake Tonnage.

The following table, prepared by the government bureau of navigation, giving the number and tonnage of the sailing and steam vessels to which official numbers were assigned during the four months ending April 30th last, shows the wonderful progress the lake trade is making:

DIVISIONS.	Sailing Vessels.		Steam Vessels.	
	No.	Tonnage.	No.	Tonnage.
New England	38	5,370.19	6	494.19
Middle Atlantic and Gulf	62	4,940.18	33	7,332.46
Pacific	12	730.03	27	3,422.42
Northern lakes	0	3,767.66	43	39,383.19
Western rivers			17	3,108.88
Total	112	14,808.06	126	53,741.14

The new tonnage on the lakes (all new vessels) comprised over two-thirds of all the new tonnage of the country during the last quarter year.—[Plain Dealer.

Steel Rail Prices.

Mr. Carnegie is quoted by the New York *Herald* as follows: "Steel rails recently sold in Pittsburgh as cheap as delivered in London by English manufacturers, £5 per ton. The prices we are getting for steel plates are about the same as prevail in England. Hitherto English prices have depended on the American demand. Now the demands of the rest of the world, exclusive of America, keep manufacturers busy. As long as this condition continues America will be able to export to South American ports articles in which heretofore she has not been able to compete with Europe, so there appears now to be a great chance for America to establish more extensive commercial relations with her neighbors. I predict that the steel rails which Canada will require this season will be furnished by American manufacturers."

THE RACE FOR CHEAP FUEL.

An Extensive Fuel Gas Plant.

Akron, O., is to have an extensive fuel gas plant, which the Akron *Beacon* thus describes:

The generator house will be a two-story, brick structure, 50x75 feet in dimensions. The first story will be 13 feet high, and the floor will be four feet below the grade level. In this lower room of the building all generators will be placed. At the top of the generators, in which the gas is made from slack coal, will be an iron floor supported on heavy iron beams and columns, which will be the floor for the second story of the generator house. This second story will be used as an operating room from which coal will be charged into the generators, which open at the top, having a down draft, and all operating machinery will be placed in this room. The roof over this building will rest on heavy wooden trusses of sufficient strength to carry coal conveyors and coal bins, one of which will be placed directly over each generator, so that coal can be fed into the generators automatically, if desired. The walls will be of brick with pilasters, and will present a handsome exterior.

The boiler house and purifying house adjoining the generator house will also be of brick. This will be 20x30 feet in size. In this will be placed a battery of two boilers, and pumping machinery for water supply.

The purifying house will be 45x75 feet in dimensions. This room will have a capacity of six purifiers, each 16 feet square and 3 feet 6 inches deep. As an extension to this room will be a condenser and scrubber room which will be 22x24 feet in dimensions. In this will be located the condensers and scrubbers through which the gas passes after leaving the generators and before entering the purifiers. On the other end of the purifying room will be another extension in which large station meters will be located to measure the gas. Here the offices of the works will also be located, and will be fitted up in neat and comfortable style. All these rooms together, constituting the purifying house, will be built of brick, two stories high, with a mansard roof construction in wood, forming a third story. Several modern features will be introduced in these buildings. One will be a hydraulic lifting apparatus for lifting and transporting large wrought iron covers, which form the tops of the 16 feet square purifiers, and which enable one man to do this work. Another feature is the arrangement of the third story over the purifying house, which will be utilized for a revivifying room for the purifying material, which will be transported by conveyors from boxes up to the floor, and after being revivified by the action of the atmosphere will again be filled into the boxes by specially constructed spouts. This work, in most gas works, is done by shovels and wheelbarrows, and requires a great amount of labor, which can readily be understood when it is taken into consideration that one or more of these purifiers is filled and emptied every day.

From the station meter the gas will pass into the main holder, which will be built on the telescopic principle, 80 feet in diameter and 20 feet deep sections, giving the holder, when completed, a total lift of 40 feet. From this holder, which only takes gas intended for city distribution, the gas passes through a governor which is intended to govern the pressure on the street mains as may be desired.

Another holder, 50 feet in diameter and 18 feet deep, will also be built, which is to act as a governing holder for producer gas to be delivered through a separate system of pipes to the sewer pipe and pottery works in the Sixth Ward.

The generator house will have a capacity for eight generators which will have a capacity of making 2,000,000 feet of gas per day, for city distribution, besides producer gas which alone will equal 80 tons of coal per day. It is thought that the producer gas for manufacturing purposes can be turned on in from 60 to 90 days, and that the gas for city distribution will follow soon thereafter. It is certain that the plant will be in full operation by next Winter.

To Test a New Utilization of Refuse Coal.

The possibility that the supply of natural gas will give out, and the fact that already its irregularity and expensiveness is creating serious apprehension, has stimulated inquiry at Pittsburgh as to other modes of producing cheaper fuel. Among those recently tested is refuse coal, powdered into a condition of great fineness, and the results thus far attained are somewhat surprising. The experiments are being made at the works of Morehead Bros. & Co. The test was between three furnaces, side by side, one running by natural gas, one by the Swindell gas device, and the other by natural coal, pulverized into a condition so excessively fine as to insure almost perfect combustion, and hence producing the greatest possible amount of heat. The combustion process is that invented by J. G. McAuley. The pulverization of coal, which hitherto, owing to its cost and the difficulty of controlling the product after pulverization, has been an expensive process, it is now claimed can be cheaply and rapidly effected by the "cyclone" principle of counter currents of air, in the device controlled by Erastus Wiman, of New York, who has for a year been pushing forward the application of powdered fuel with a result now to be demonstrated. The claim that this coal can be used in competition with natural gas, and that it can with economy be substituted therefor, is a bold one, and the results of the tests to-morrow are looked forward to with considerable interest.

A Wonderful Furnace.

A surprising account is given of a furnace constructed by a Philadelphia inventor to secure the perfect combustion of coal, and thus avoid the great loss of heat and waste of fuel resulting from the imperfection of the best methods hitherto employed. "In a common cylinder stove, with a few kitchen shovels of coal,"—so runs the statement of an eye-witness of one of the exhibitions of this invention—"a fire was lighted, which, in a few minutes, without artificial draft, created a heat intense enough to melt cast iron, spiegel and manganese ore. These results are accomplished by so arranging the fire that two different currents of air of different temperature pass through separate parts of the grate. A partial vacuum is created in the center of the grate, and a cyclone in the drum of the stove, thus producing perfect combustion all over the surface of the coal. In fifteen seconds from the lighting of the fire the drum is red hot. A few seconds more and a rapid vibration occurs in the drum, and is felt all over the room with startling effect. The cyclone in the stove is raging in full force, the drum loses its heat, and it is discovered that the air is being drawn down the chimney. Within four minutes from the time of lighting, the materials above mentioned may be melted, and yet the temperature of the room may be kept at a moderate heat. A 50-pound charge of coal will last 24 hours, so slow and so complete is the combustion."—[National Labor Tribune.

Compressed Air Distribution at Paris.

In connection with the system instituted at Paris some six or seven years ago, and widely noticed since then, of distributing power through underground mains in which a partial vacuum is maintained by air pumps at a central station, it is interesting to note that a compressed air system has also more recently been developed in that city, and is now, according to all accounts, meeting with general success. The company prosecuting the undertaking is known as the "Compagnie Generale des Horloges et Forces Pneumatiques," and commenced operations on a modest scale a number of years ago, when it confined itself to pneumatic transmission of time. In 1886 the company was re-organized on a larger scale and obtained a concession for forty years to distribute power by compressed air. A plant of 3,000 horse-power was installed at Belleville, and the work was pushed to such an extent that in addition to a network of 39 miles of tubing given up to clock service there are now 33 miles of underground mains conveying the compressed air for power purposes.

The two principal power mains measure 11⅞ in. in diameter. In the Fall of 1888 six electric light central stations, each embracing 100 horse-power, and three others of 50 horse-power each, were supplied with power by the company, and since then numerous smaller etectric plants, aggregating 350 horse-power, have been added. Besides these the company furnish air to a large number of other establishments, such as saw-mills, artificial ice works, printing rooms, and others. A large field, for the work of the company, is made available by by the circumstance, not, perhaps, peculiar to Paris alone, that there are many small industries requiring comparatively small powers, which, if furnished by independent boilers and engines, constitute relatively large items of expense, so large as to make any other reasonably cheap substitute highly welcome. These small industries have nearly all, where possible, availed themselves of the advantages of the compressed air system.

Financially also, we are told, the success of the company is assured. Further concessions to extend the system have been granted by the municipal council of Paris, and its wider application, therefore, seems a question of but a short time. The new districts to be opened will require a large proportion of the power for electric lighting and the company is said to already have contracts in them for supplying not less than 150,000 lamps.

German Competition in Hardwares.

"The metallurgical industries of the country," says London *Iron*, "have been accustumed for a long while past to the accusation of undue tenacity to old and worn-out practices and old-fashioned methods of doing business. In consular reports and in other communications German enterprise has again and again been held up as vanquishing us in foreign markets by its adaptation of manufactures to the special reqirements of various customers. According to a speaker at the annual meeting last week of the Wolverhampton Chamber of Commerce, the accusation is in no wise warranted by the facts. The fact is, it is stated, that there is no possibility of meeting the competition of the Germans in foreign markets. How poorly attempts at such a consummation are rewarded is seen in the case of the Wolverhampton chamber itself. In order that local makers might compete for the business, this institution, at some expense, recently imported a quantity of German locks, samples of those which were being sold in Spain. According to Mr. J. C. Tildesley, himself a lock-maker, the prices affixed to these specimens were so low that it was impossible for English makers to touch them. The success of the German makers is not, he asserts, to be found in superior business qualities, but in the fact that the German operatives who produce the goods receive far lower wages than the English operatives, and work longer hours. The statement is a striking illustration of some of our industrial disadvantages, and Mr. Tildesley is justified in his protest against the tendency to make British manufacturers responsible for a state of things induced by conditions over which they have no control."

A New Non-Magnetic Alloy.

A new alloy has recently been brought out in Geneva, Switzerland, by Messrs. Ostermann and Lacroix, to be used as a substitute for steel in the manufacture of different parts of watch mechanism, such as, for example, hair springs, and balance wheels which are apt to cause a good deal of annoyance through becoming magnetized. The alloy, we need, therefore, perhaps scarcely say is claimed to be non-magnetic. It is made up from 30 to 40 parts of gold, from 30 to 40 parts of palladium, 0.1 to 5 parts of rhodium, 10 to 20 parts of copper, 0.1 to 5 parts of manganese, and the same proportion of silver and of platinum. The copper and manganese are first mixed, after which the other metals are added, or all the metals may be put into a crucible at the same time, the manganese being used for the bottom layer.

EUROPE raises 1,200,000,000 bushels of wheat yearly, twice as much as the American production. Our wheat land requires 50,000,000 bushels for seed. We export 95,000,000 bushels.

NOTABLE BLAST FURNACE CAPACITY.

BULLETIN OF THE AMERICAN IRON AND STEEL ASSOCIATION.

The recent consolidation of the three big steel companies of Illinois into one company, controlling, besides its steel works and rolling mills, 14 large blast furnaces, makes an inquiry into the relative capacity for producing pig iron of the large iron companies of the world an interesting subject. The Illinois Steel Co. heads the list in this country in number of stacks, while its producing capacity is much greater than that of any other company in this country, and very much greater than that of any company in Europe. The aggregate capacity of the 14 furnaces of the Illinois Steel Co. is rated at about 800,000 gross tons per annum.

Coming next to these in capacity are the nine furnaces belonging to Mr. Andrew Carnegie and his partners, at Pittsburgh. Their aggregate capacity is about 600,000 tons per annum. Two more furnaces are soon to be built by Mr. Carnegie and his associates, and when these are completed their 11 furnaces will closely approach in capacity those of the Illinois Steel Co.

Next in order in this country come the 10 furnaces of the Tennessee Coal, Iron & Railroad Co., situated at and near Birmingham, in Alabama, and at Cowan and South Pittsburgh, in Tennessee. Their aggregate capacity is about 400,000 tons per annum.

The Pennsylvania Steel Co., with its four stacks at Steelton, Pa., has a capacity for producing about 150,000 tons of pig iron a year. It has also four furnaces of the largest size built and building near Baltimore, Md. When all these are completed this company will possess a furnace capacity which will give it third place among the pig iron producers of this country.

The Cambria Iron Co., controlling nine stacks at and near Johnstown, and at Hollidaysburg, Pa., has a capacity for producing about 350,000 tons of pig iron per annum.

The well-known Thomas Iron Co., the largest producer of foundry pig iron for the open market in the East, controls 12 furnaces, all in Eastern Pennsylvania. These furnaces, however, are not of the largest size, and several of them are old; hence their total annual capacity is rated at somewhat less than 200,000 gross tons per annum.

No other American companies have furnace capacity sufficient to produce 200,000 tons of pig iron in one year, although several could produce in the neighborhood of 150,000 tons yearly, namely: The Cleveland Rolling Mill Co., at Cleveland, O.; the Bethlehem Iron Co., at Bethlehem, Pa.; the Troy Steel & Iron Co., at Troy, N. Y.; the Isabella Furnace Co., near Pittsburgh, Pa.; Messrs. Laughlin & Co., Limited, at Pittsburgh, Pa.; and the Sloss Steel & Iron Co., at Birmingham, Ala. Several other companies, North and South, each have sufficient furnace capacity for producing over 100,000 tons a year.

Looking at the iron industry of our great rival, Great Britain, we find several companies or firms with many more furnaces than those owned or controlled by any American company, but none whose producing capacity approaches in magnitude that of the leading American company, the Illinois Steel Co.

According to a recent edition of *Ryland's Directory*, Messrs. Bolchow, Vaughan & Co., Limited, of Middlesbrough, Yorkshire, who have the largest blast furnace capacity in Great Britain, have 28 blast furnaces, but their total capacity is rated at 580,000 tons per annum. Messrs. Wm. Baird & Co. have 33 furnaces in Scotland, but their total yearly capacity is given as only 340,000 tons. The Barrow Hematite Steel Co., Limited, of Barrow-in-Furness, Lancashire, has 14 furnaces, and their total yearly capacity is 360,000 tons. The Messrs. Bell Bros., Limited, of Middlesbrough, have 14 furnaces, whose total yearly capacity is rated at 327,000 tons. Messrs. Merry & Cunninghame, makers of the well-known "Glengarnock" and "Carnbro" brands of pig iron, have 20 furnaces in Scotland, with a total yearly capacity of 208,000 tons. The Wigan Coal & Iron Co., Limited, of Wigan, in Lancashire, Eng., with 10 furnaces, has about the same capacity.

These British companies, with many more furnaces, produce much less pig iron than American companies, partly because many of the British furfurnaces are small and of antiquated construction, and partly because much of the ore used in Great Britain is "lean," requiring three tons or more of ore to produce a ton of pig iron; whereas, with the best Lake Superior ores, which are so largely used in American furnaces, a ton of pig iron can be produced with much less than two tons of ore, while with the Cornwall, Hudson River, and Salisbury ores, which are so largely used, the quantity of ore required to produce a ton of pig iron seldom exceeds two tons. The main cause, however, of the smaller production per furnace in Great Britain is that at British furnaces of the latest construction the blast machinery is run at lower pressure, and all other appliances at proportionately slower speed than at American furnaces.

Outside of Great Britain the only iron-making companies in any country whose pig iron producing capacities are sufficiently large to compare with the leading American companies are Krupp's at Essen, in Germany; J. Cockerill & Co., at Seraing, in Belgium, and Schneider & Co., at Le Creusot, in France. None of these works, however, produce as much pig iron annually as the largest English works, and consequently produce very much less than the largest American works.

Steel Boats from One Sheet.

The Leed's *Mercury*, England, thus talk of a new method of constructing boats: There seems to be no bounds to the skill and ingenuity of Leeds engineers. Every one acquainted with things nautical knows how seriously ship's boats suffer from being slung up at the davits and kept there for lengthened periods exposed to the weather—rain one day and sunshine the next. It not infrequently happens that when in harbor—and it may be at sea in a case of emergency—a boat which has for some time been exposed to such deteriorating influence is lowered into the water, it is found to be leaky. Like large vessels, boats suffer more damage when "laid up" than when in use, unless, of course, they are kept under cover. Ships' boats hanging at the davits are also in danger of being smashed by seas breaking on board. In order to provide against the loss and danger arising from such conditions it is proposed to construct boats of steel, and, what is more interesting and novel, out of single plates. Machinery has been patented for the purpose and is about to be manufactured by a Leeds engineering firm. The boats thus produced will be of various sizes. We understand that a company is to be formed for the carrying out of the project. It is obvious that there must be great economy in this method of manufacturing boats in all sizes like so many nails or pipe.

FROM the figures given in the advance sheets of the yearly statistical report of the British Iron Trade Association, and published in some of the English trade journals, we learn that the total quantity of pig iron produced in the United Kingdom in 1888 was 7,898,634 gross tons, an increase of 339,116 tons as compared with 1887.

LIST OF PATENTS.

Relating to Iron, Steel, Metal, Machinery, Hardware and Mining Interests.

Reported expressly for this paper by H. T. Fisher, (late Ex. U. S. Patent Office), Patent Attorney, 34 Blackstone Building, Cleveland, O.

PATENTS BEARING DATE MAY 28, 1889.

Iron into malleable iron or steel, apparatus for converting crude, J. W. Bookwalter, Springfield, O.
Iron ore, reducing, C. J. Eames, New York, N. Y.
Iron ores, apparatus for deoxidizing, M. R. Conley, New York, N. Y.
Metallurgical furnace, W. Stubblebine, Philadelphia, Pa.
Nickel and nickel alloys non-magnetic, rendering, H. Ostermann and C. Lacroix, Geneva, Switzerland.
Ore concentrator, W. McDermott, Morristown, N. J.
Ore-roasting furnace, I. B. Hammond, Chicago, Ill.
Ore separator, magnetic, C. M. Ball and S. Norton, West Troy, N. Y.
Ores by magnetism, separating C. M. Ball and S. Norton, West Troy, N. Y.
Shears for cutting metal, anvil, W. H. Adams, Franklin, Pa.
Shears for cutting metal bolts, W. Robinson, Churdan, Iowa.
Sheet metal bending machine, S. Y. Buckman, Philadelphia, Pa.
Turn-buckles, making, J. H. Simpson, Pittsburgh, Pa.
Wire into a continuous row of clamps, machine for converting, W. Decker, Saxony, Germany.
Wire of one sectional form into wire of another sectional form, drawing, W. Taylor, Allegheny, Pa.

A Great Reduction

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CLEVELAND, OHIO.

Combined Punch and Stock Shear.

Seven sizes with 8", 10" or 12" blades, and 6" to 15" Throat Punch. Weigh 100 to 600 pounds. For light or heavy work, Boiler and Stack Builders, Carriage and Copper Smiths, and Railing Makers, &c. Can punch near the edge, Angle and Flange Iron, Pipe and Stacks, Etc.

ADAPTED for cutting Bar Iron, especially Sheet Iron of all kinds, for Trimming, Slitting, Etc. Also make the Punch and Shear separate.

TOOLS FOR WORKING SHEET METAL.

Squaring Shears and Slip Roll or Plain Forming Rolls, &c

Bertch & Co.,

CAMBRIDGE CITY, IND.

Write for circulars and mention this paper.

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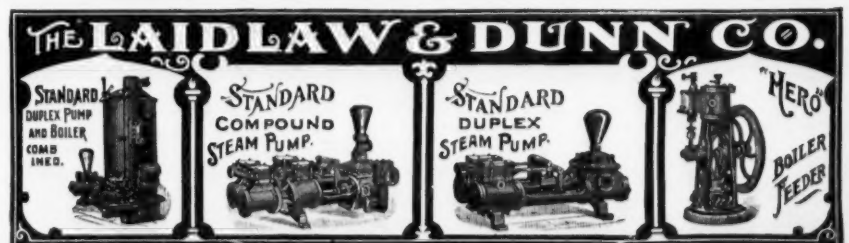
THE LAIDLAW & DUNN CO.



PUMPS OF EVERY DESCRIPTION. CINCINNATI, O. SEND FOR CIRCULAR.

IRON AND STEEL MARKETS.

PIG IRON.

CLEVELAND (f. o. b. cars, four months): Bessemer, $17 00@00 00; No. 1 Foundry, $15 65@16 15; No. 2 Foundry, $14 65@15 15; No. 1 Gray Forge, red short, $13 65@14 15; No. 2 Gray Forge, neutral, $13 15@13 65; No. 1 American Scotch, $16 90@17 55; No. 2 American Scotch, $15 90@16 55.

CHICAGO (reported by Rogers, Brown & Co.): CHARCOAL IRONS—L. S. Nos. 1 and 2 Foundry, $18 00@19 00. Southern C. C. Foundry, $17 00@13 00; H. R. C. C. Foundry, $20 00@23 00. COKE AND BITUMINOUS—Ohio H.R. Strong Softeners No. 1, $18 25@00 00; Ohio H. R. Strong Softeners No. 2, $17 25@00 00; Ohio Hocking Valley Strong Softeners No. 1, $17 75@00 00; Ohio Hocking Valley Strong Softeners No. 2, $16 75 @00 00; Ohio Hocking Valley Silvery Softeners No. 1, $17 00@00 00; Ohio Hocking Valley Silvery Softeners No. 2, $16 00@00 00; Ohio Black Band Softeners No. 1, $18 00@18 50; Ohio Jackson Co. pure Softeners No. 1, $17 75@18 25; Ohio Jackson Co. pure Softeners No. 2, $16 75 @17 75; Norton & Ashland Brands, Ashland, Ky., pure Softeners No. 1, $17 00@17 50; do. No. 2, $16 00@16 50; Southern Coke Foundry No. 1, $16 00@00 00; Southern Coke Foundry No. 2, $15 25@00 00; Southern Coke Foundry No. 3, $14 75@00 00; Southern Coke Softeners No. 1, $15 25@00 00; Southern Coke Softeners No. 2, $14 25@00 00; Southern Coke Grey Forge $13 75@14 00; No. 1 Foundry (local furnaces at Chicago and in Northwest) $15 50@16 00; No. 2 Foundry $14 50@15 00; No. 3 Foundry $13 50 @14 00. CAR WHEEL AND MALLEABLE—Lake Superior Nos. 1 to 6, $18 50@19 50; Standard Southern Nos. 3 to 6, $19 00@19 50; Hanging Rock Cold Blast $23 50@26 00; Hanging Rock Warm Blast $21 00@23 00

CINCINNATI (reported by Rogers, Brown & Co.): HOT BLAST FOUNDRY—Ohio and Southern Coke No. 1, $14 75@15 25; Ohio and Southern Coke No. 2, $13 75@14 50; Ohio and Southern Coke No. 3, $13 00@13 50; Ohio Soft Stone Coal No. 1, $15 75@16 50; Ohio Soft Stone Coal No. 2, $14 75@15 50; Mahoning and Shenango Valley, $16 00@16 50; Hanging Rock Charcoal No. 1, $20 00@22 00; Hanging Rock Charcoal No. 2, $19 00@21 50; Tennessee and Alabamba Charcoal No. 1, $17 50@18 50; Tennessee and Alabama Charcoal No. 2, $16 50@17 50. FORGE—Strong Neutral Coke, $12 75@13 25; Mottled Neutral Coke, $12 00@12 50; Cold Short Coke, $12 50@00 00. CAR WHEEL AND MALLEABLE—Southern Car Wheel, $23 00@24 50; Hanging Rock Cold Blast, $22 00@25 00; Lake Superior Malleable and Car Wheel, $20 00@21 00.

LOUISVILLE (reported by Geo. H. Hull & Co.): Southern Coke No. 1 Foundry (new classification), $14 25@14 75; Southern Coke No. 2 Foundry (new classification), $13 75@14 25, Southern Coke No. 3 Foundry (new classification), $13 00@13 50; Grey Forge, $12 50@13 00; White and Mottled, different grades, $12 00@12 50; Silver Grey, different grades, $12 50@13 50; Southern Charcoal No. 1 Foundry, $16 00@16 50; Southern Charcoal No. 1 Mill, $14 50@15 00; Southern Car Wheel, Standard brands, $21 75@22 75; Southern Car Wheel, other brands, $18 00@19 50; Hanging Rock Coke No. 1 Foundry, $15 50@16 00; Hanging Rock Charcoal No. 1 Foundry, $19 50@ 21 00; Hanging Rock Cold Blast, $20 75@22 75; Hanging Rock Warm Blast, $00 00@00 00.

ST. LOUIS (reported by Rogers, Meacham & Shields): HOT BLAST COKE AND CHARCOAL—Southern Coke No. 1, $15 25@16 00; Southern Coke No. 2, $14 75@15 25; Southern Coke No. 3, $14 25@14 75; Southern Grey Forge, $13 25@ 13 75; Southern Charcoal No. 1, $18 00@18 50; Southern Charcoal No. 2, $17 00@18 00; Missouri Charcoal No. 1, $16 00@16 50; Missouri Charcoal No. 2, $15 00@16 00; Ohio Softeners, $17 00@ 19 00. CAR WHEEL AND MALLEABLE IRONS—Lake Superior, $19 75@22 00; Southern, $19 00@ 23 00. CONNELLSVILLE COKE—East St. Louis, $4 40; St. Louis, $4 55.

DETROIT (reported by William F. Jarvis & Co.): Lake Superior Charcoal, all Numbers, $19 50@20 00; Lake Superior Coke, all Ore, $18 00@19 00; Lake Superior Coke, Cinder Mixed, $17 75@18 25; Standard Ohio Black Band, $18 00@19 00; Southern No. 1, $17 00@ 17 50; Southern Gray Forge, $15 00@15 50; Southern Silvery, $16 00@16 50; Jackson County (Ohio) Silvery, $18 00@18 75; Old Wheels, $18 50 @19 00.

PITTSBURGH (reported by A. H. Childs): No. 1 Foundry, $16 00@16 50; No. 2 Foundry, $15 00@15 50; No. 1 Mill, $14 25@14 50; White and Mottled, $13 00@13 50; Warm Blast Charcoal, $19 00@22 00; Cold Blast Charcoal, $22 00 @28 00; Bessemer, $16 25@16 50.

MERCHANT IRON AND STEEL.

Flat Bar.

1½ to 4 by ⅜ to 1 inch.....1 70
4¼ to 6 by ⅜ to 1 inch.....1 80
1¾ to 6 by 1⅛ to 2 inch.....2 10
1¼ & 1⅜ by ⅜ to ¾ inch.....1 80
1 & 1⅛ by ⅜ to ¾ inch.....1 80
⅝, ¾ and ⅞ by ⅜ to ⅝ inch.....2 20

Round and Square.

1 to 1⅞ inch.....1 70
2 to 2⅝ inch.....1 90
2¾ to 3¼ inch.....2 20
3⅜ to 4 inch.....2 70
4⅛ to 4½ inch.....3 20
4¾ to 5 inch.....3 40

Oval.

⅜ to 1¼ inch.....2 10
⅜ to ¾ inch.....2 30
½.....2 50
¾.....2 90

Half Oval and Half Round.

1½ to 3 inch.....2 80
⅜ to 1¼ inch.....2 40
⅝ to ¾ inch.....2 90
½.....3 20
¾.....4 70

Heavy Band.

⅜ to 6 by ¼ and 5-16 inch.....1 95
1 to 1⅜ by ¼ and 5-16 inch.....2 05
¾ to ⅞ by ¼ and 5-16 inch.....2 25
⅜ to ⅜ by ¼ and 5-16 inch.....2 75

Hoops.

1¼ to 4, Nos. 13 to 15.....2 55
1¼ to 2, Nos. 16 to 18.....2 65
1¼ to 2, No. 19.....2 75
1¼ to 2, No. 20.....2 85
1¼ to 2, No. 21.....2 95
1¼ to 2, No. 22.....3 05
15-16, 1 and 1⅛, Nos. 13 to 15.....2 75
15-16, 1 and 1⅛, Nos. 16 to 18.....2 85
15-16, 1 and 1⅛, Nos. 19 and 20.....2 95
15-16, 1 and 1⅛, No. 21.....3 05
15-16, 1 and 1⅛, No. 22.....3 25
⅞, Nos. 13 to 15.....2 95
⅞, Nos. 16 to 18.....2 05
⅞, Nos. 19 and 20.....2 15
⅞, No. 21.....3 25
⅞, No. 22.....3 35
13-16, Nos. 13 to 15.....3 15
13-16, Nos. 16 to 18.....3 25
13-16, Nos. 19 and 20.....3 35
13-16, No. 21.....3 45
13-16, No. 22.....3 55
¾, Nos. 13 to 15.....3 25
¾, Nos. 16 to 18.....3 35
¾, Nos. 19 and 20.....3 45
¾, No. 21.....3 55
¾, No. 22.....3 65
11-16, Nos. 13 to 15.....3 45
11-16, Nos. 16 to 18.....3 55
11-16, Nos. 19 and 20.....3 65
11-16, No. 21.....3 75
11-16, No. 22.....3 85
⅝, Nos. 13 to 15.....3 85
⅝, Nos 16 to 18.....3 75
⅝, Nos. 19 and 20.....3 95
⅝, No. 21.....4 05
⅝, No. 22.....4 15
⅝, No. 23.....4 25

Light Band.

1½ to 6 by ⅛ to 3-16 in.....2 25
1½ to 6 by Nos. 11 and 12.....2 35
1 to 1⅜ by ⅛ to 3-16 in.....2 35
1 to 1⅜ by Nos. 11 and 12.....2 45
⅞ and 13-16 by ⅛ to 3-16 in.....2 65
⅞ and 13-16 by Nos. 11 and 12.....2 75
¾ and 11-16 by ⅛ to 3-16 in.....2 95
¾ and 11-16 by Nos. 11 and 12.....3 05
⅝ and 9-16 by ⅛ to 3-16 in.....3 25
⅝ and 9-16 by Nos. 11 and 12.....3 30
½ by ⅛ to 3-16 in.....3 50
½ by Nos. 11 and 12.....3 60

Wagon Box Iron.

⅞ inch, beveled edge, by Nos. 11 and 12.....2 75
⅞ inch, " " " 13 and 14.....3 05
¾ inch, " " " 11 and 12.....3 05
¾ inch, " " " 13 and 14.....3 25

Sheet Iron.

No. 10 to 14.....2 50
No. 15 to 17.....2 70
No. 18 to 21.....2 80
No. 22 to 24.....2 90
No. 25 to 26.....3 00
No. 27.....3 10
No. 28.....3 30

Iron Boiler Plates.

Tank, ¼ inch and heavier.....2 35
C No. 1, " " 2 60
C H No. 1 " " 2 85
C H Flange, " " 3 55
Extra Flange, " 3 95
Solid Fire Box, " 4 85

Steel Boiler Plates—1-4 in. and Heavier.

Tank.....2 55
Shell.....2 95
Flange.....3 20
Marine Flange.....3 70
Fire Box.....4 35

Above includes plates 90 inches wide.
90 to 96 in. wide.....½c ℔ extra
96 to 100 in. wide.....1 c "
100 to 104 in. wide.....1½c "
104 to 116 in. wide.....special

American Cast Tool Steel.

ROUND, SQUARE AND OCTAGON. cts. ℔s

1 to 2 in. inclusive.....09
9-16 to ½ in " 09
7-16 to ⅜ and 2⅜ to 3 in.....10½
3⅛ to 4 in.....11
⅜ to 11-16 and 4⅛.....10½
⅛ to 6 in.....11½
¼ to 9-32 and 6⅛ to 7 in.....12
3-6 in.....14

Flats.

cts. ℔s

2 to 9-16 wide by 2 to ⅝ thick.....0

Bessemer and O. H. Steel.

ct. ℔

Machinery.....base price, 02¾
Tire.....02¾
Spring.....03¼
Sleigh Shoe.....02¾
Toe Calk.....03
Cutter Shoes, tapered and burr.....03

English Tool Steel.

Jessop's.....16c
Hobson's "Best".....16c
" "Choice".....36c

Burden Boiler Rivets.

½, ⅝, 11-16 and ¾ inches diameter.....4 00
Bridge ½, ⅝, 11-16 and ¾ inch diam.....4 00

SCRAP IRON AND OLD METAL.

Net Ton.

No. 1 R. R. wrought scrap.....$17 50
No. 1 wrought scrap.....15 00
No. 1 Machine cast scrap.....12 00
Stove Plate (free from burnt iron).....10 00
Grate Bars.....8 50
Pipes and flues (Clean).....13 00
Tank iron.....12 50
Hoop and band iron.....10 00
Iron axles.....24 00
Light sheet iron.....10 00
Axle turnings.....14 00
Wrought turning (free from cast).....12 50
Wrought iron, oily drillings.....11 00
Cast borings.....9 00
Malleable iron.....10 00
Uncut wrought iron boilers.....10 00
Steel boiler plates.....14 50
Old iron T rails.....gross tons 22 00
Old steel rails.....18 50
Car wheels.....20 00
Old copper.....℔ 10
No. 1 H. red Brass.....11
Heavy yellow brass.....8½
Light yellow brass.....6
Scrap Zinc.....
Tea Lead.....
Heavy Lead.....3¼

PITTSBURGH & WHEELING COAL CO.,
MINERS AND SHIPPERS OF
Ohio Steam Coal and Coke.
Mines on the Cleveland, Lorain & Wheeling R. R. Capacity, 3,000 tons daily.
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BESSEMER STEEL RAILS,
Blooms and Billets, Steel Angles, Forgings, Bar and Spring Steel, Steel Street Rails, Steel Oil Barrel Hoops, Wire of all Kinds, Iron and Steel Boiler Plates, Galvanized and Black Sheet Iron, Corrugated Iron Roofing, Sheet Steel.

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Iron Ore, Pig Iron and Metals.
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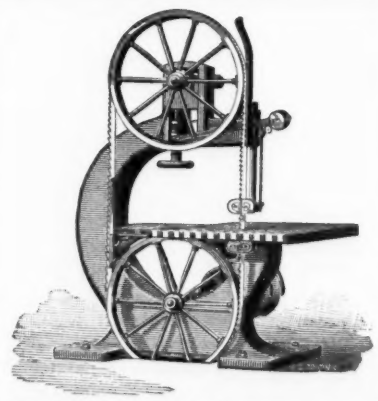

$80 will buy the best band saw in the world.
$100 will buy our new patent 40-inch band saw.
$185 will buy our new patent band re-sawing machine.
$125 will buy the best automatic rip-sawing machine. Weatherboarding attachment included, and one 12-inch rip saw. For further particulars address
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MOORE'S HILL, IND.

THE MORGAN MACHINE CO.,
MANUFACTURERS OF
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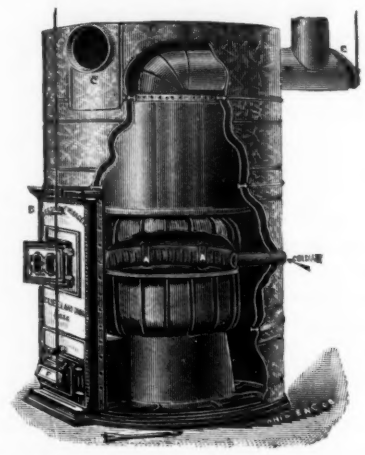
Burns Hard Coal, Soft Coal, Coke or Natural Gas.



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ENGINEERS AND CONTRACTORS.
Worthington Steam Pumps, Electric Light Engines and Automatic and Slide Valve Engines of all Descriptions.
Steam Plants, Complete, Furnished and Set Up.

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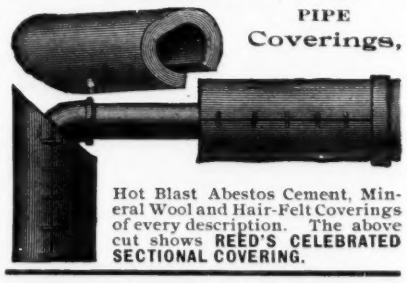

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CHEMISTRY - AND - PHYSICS.
Tests of Ores and Strengths of Material requiring expert work a specialty. Address,
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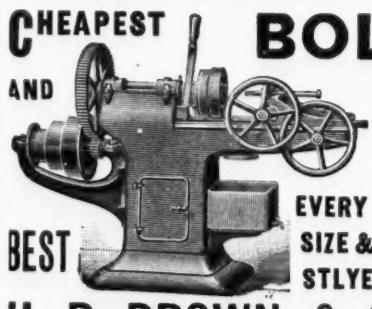
New Albany, Indiana.

CHEAPEST AND BEST BOLT CUTTERS.



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H. B. BROWN & CO.,
EAST HAMPTON, CT.
We allow One Dollar to every purchaser sending us this advertisement.

MACHINERY SUPPLY MARKET.

Anvils.

American ..... ℔ lb 9@10
Wrights ..... ℔ lb 9½

Bellows.

Blacksmiths' { Hill's ..... dis 40 / Bullock's .... dis 50&10
Moulders' ..... dis 40@40&10
Hand ..... dis 40&10@50

Belting.

Boston Belting Co's standard ..... dis 70@70& 5
" " " extra ..... dis 60&5@60&10
" " " best ..... dis 55
Hoyt's Short Lap ..... dis 45
Cleveland Rubber Co. extra standard dis 60&10
Shultz Raw Hide Leather Belting, single ..... dis 30
Shultz Raw Hide Leather Belting, double ..... dis 35
Standard, oak tanned ..... dis 55@60
Alexander Brothers' pure oak tanned. ... dis 45

Blowers and Exhausters.

B. F. Sturtevant's ..... dis 20
Boston Blower Co. ..... dis 35
Buffalo ..... dis 35

Borax.

..... ℔ lb 9½@10½

Chalk.

White ..... ℔ gross 50
White Crayon ..... ℔ gross 12@12½ dis 10
Red ..... dis 70
Blue ..... dis 85

Chucks.

Cushman's 4 Jaw Independent ..... dis 40
" Combination ..... dis 40
" Geared Scroll ..... dis 30
" 2 Jaw Brass Workers. ..... dis 25
" Drill ..... dis 35
Wescott's Scroll Combination ..... dis 30
" Independent ..... dis 40
" Little Grant Drill ..... dis 30
Horton's Universal & Ind ..... dis 40
National Combination ..... dis 40
Sweetland " ..... dis 40
Skinner " ..... dis 40
" Independent ..... dis 40
Almond Drill ..... dis 25
Morse " ..... dis 15
Skinner " ..... dis 30

Cutters and Reamers.

Cleveland ..... dis 10@15
Pratt & Whitney ..... dis 10@15
Standard ..... dis 10@15
Brown & Sharpe, Milling Cutters ..... dis 15
" " Gear Cutters. ..... dis 15

Crowbars.

Cast Steel ..... ℔ lb 4
Iron, steel points ..... ℔ lb 3½

Drill and Drill Stocks.

Twist drills ..... dis 50&10
Morse Taper and Straight shank to 1½" ..... dis 50&10
Morse Taper and Straight shank Larger than 1½" ..... dis 25
Drill Sockets ..... dis 20
Standard ..... dis 50&10
Cleveland ..... dis 50&10
Maneer's bench ..... dis 50&25
Maneer's post ..... dis 50&10

Emery.

	No. 4 to 46 gr.	No. 54 to 150. gr.	Flour, F.	C. F. FF.
Kegs, ℔ lb	4 c	5 c		2½c
½ kegs ℔ lb	4¼c	5¼c		2¾c
¼ kegs ℔ lb	4½c	5½c		3 c
10 lb cans, 10 in case	6 c	6½c		5 c
10 lb cans, less than 10	10 c	10 c		7¼c

Emery Cloth and Paper.

Barder, Adamson & Co. ..... dis 40@46
H. H. Barton ..... dis 40@46

Emery Wheels.

Detroit ..... dis 50@60
Norton's ..... dis 55@60
Grant ..... dis 55@60
Union Stone ..... dis 60
Sterling ..... dis 60
Vulcanite ..... dis 15@20
Celluloid ..... dis 10
Northampton ..... dis 55
Crystal ..... dis 65@70
Vitrified ..... dis 60

Files.

Nicholson ..... dis 60&10@60&10&10
" X. F. ..... dis 25
Kearney & Foot ..... dis 60&10@60&10&10
Black Diamond ..... dis 60&10@60&10&10
Arcade ..... dis 65@70
Disston's ..... dis 65@70
Western ..... dis 70
Stub's ..... dis 25
Grobet's ..... dis 30
Reynolds Bros.' Hand Cut ..... dis 50

Hammers.

P. S. W. ..... dis 40
Atha new list, Jan. 15, 1887 ..... dis 50
Heavy hammers and sledges under 5 lbs. 18c over 5 lbs 14c, new list.

Jack Screws.

Illinois Bolt Co. list ..... dis 70

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4¾	4	3¼	3½
Hexagon	15½	11½	8½	6	5¼	5¼	5
Washers	9	8	7	5	4½	4½	4½

In lots less than 100 lbs, ℔ lb add ½c., lb boxes add 1c to list.

Nails (wire.)

List July 14, 1887 ..... dis 70 &10
Standard Penny Nails, ℔ keg card rate
{ Car lots $2.50
{ Less than car lots $2.60

Oilers.

Zinc and Tin ..... dis 60
Brass and Copper ..... dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ℔ doz ..... dis 10@10&10

Packing, Steam.

Boston Belting Co. ..... dis 60
American Packing Hemp ..... ℔ lb 10@11
Russia Packing " ..... ℔ lb 14
Italian Packing " ..... ℔ lb 13@14
Plumbago Piston ..... ℔ lb 40
Morrison's " ..... ℔ lb 50
Square Flax " ..... ℔ lb 70
Sheet Rubber ..... ℔ lb 12@24
Excelsior Rubber. ..... ℔ lb 48

Picks.

Railroads, 5 to 6 lbs ..... $12 dis 60&5@60&10
" 6 to 7 lbs ..... $13 dis 60&5@60&10

Pulleys.

Iron Pulleys, Walker List ..... dis 45
Medart Pulleys ..... dis 55
Split Wood Pulleys ..... dis 45

Rivets.

Iron, Thousand, list November 17, ... dis 50@50&10
Iron, Ordinary, Cooper's Block and Carriage list November 17 ..... dis 50
Copper ..... dis 50@50&10

Rope.

Manilla, ½ inch and over ..... ℔ lb 15¼
Sisal, ½ inch and over ..... ℔ lb 13¾

Sand Paper.

B. A. & Co. ..... dis 40@40&10
H. H. Barton's ..... dis 40@40&10
New England Flint ..... dis 40@40&10
Barton's Garnet ..... dis 20

Saws.

Disston's Circular ..... dis 45
" Band ..... dis 20
" Scroll ..... Net
Hack Saw Stubs ..... dis 20
" " Eureka ..... dis 20
" " Star ..... dis 20
Saw Swages Disston's ..... dis 20
Atkins' Cicular Saws ..... dis 50
" Mill, Mulay and Drag Saws. dis 40&10
" Wood Saws ..... dis 40&10
" Silver Steel Diamond Cross-cut Saws ..... dis 70c per ft
" Dexter Cross-cuts ..... dis 50c "
" Diamond " ..... dis 30c "
" Tuttle Tooth Cross-cuts. dis 25c "
" One-man Cross-cuts ..... dis 32c "
No. 1 Handles ..... dis 23c per pair
No. 6 " ..... dis 16c "
Excelsior Saw Tools ..... $6 per doz
Perfection " ..... $15 "

Screws.

Wood Screws—List Jan 27, 1889.
Flat head iron ..... dis 50
Round head iron ..... dis 40
Flat head brass ..... dis 45
Round head brass ..... dis 35
Square Cap ..... dis 65
Hexagon Cap ..... dis 60
Set C. H. C. P. ..... dis 70
Machine, flat head, iron ..... dis 55
Machine, round head, iron ..... dis 50
Bench and hand—
Lag or coach ..... dis 75@75&10
Coach, patent gimlet point ..... dis 75

Shovels and Spades.

Ames' list November 1, 1885 ..... dis 20
Dennis ..... dis 5.25
Hussey & Binns, railroad ..... dis 8.00

Taps.

Cards, Hand and Nut to 2 in ..... dis 50
Carpenters' " " " ..... dis 50
Morse " " " ..... dis 50
Pratt & Whitney " " ..... dis 25
Machine Screw Taps ..... dis 55
Pipe Taps to 2½ in ..... dis 70
Stay Bolt Taps ..... dis 25
Stove Bolt Taps ..... dis 50
Pulley Taps ..... dis 40

Twine.

	BC.	B.
No. 12, Flax Twine, ¼ and ½ lb Balls		21c@29c
No. 18 " " ¼ and ½ "		18c@28c
No. 36 " " ¼ and ½ "		16c@27c
2-Ply Hemp, ¼ & ½ lb Balls (Spring Twine)		11½c
3-Ply " 1lb Balls		12@12¼c
3-Ply " 1½ lb Balls		11@11¼c
Cotton Wrapping, 5 Balls to lb		15@16c

Vises.

Solid Box ..... dis 60
Parker's ..... dis 20@25
Prentiss ..... dis 20
Stephen's ..... dis 25@30
Barrett's ..... dis 30
Miller's Falls ..... dis 40
Merrill's ..... dis 10@15
Howard ..... dis 30
Maneer's machinist ..... dis 50&10

Wire.

New List, Jan. 18, 1884
Brass and copper ..... dis 20@25
Bright and annealed, Nos. 0@18 ..... dis 70&10@75
" " Nos. 19@26 ..... dis 75@75& 5
" " Nos. 27@36 ..... dis 75&10& 5
Coppered Nos. 0 to 18, market list ..... dis 70@70& 5
Galvanized Nos. 0 to 18 " " ..... dis 65&5
Tinned market Nos. 0 to 18 ..... dis 67½
Cast steel ..... dis 50
Tinned Broom Wire ..... dis 70&5@70&10
Annealed Fence, Nos. 8 and 9 ..... dis 75
Annealed Grape, Nos. 10 to 14 ..... dis 75
Stub's Steel Wire regular ..... $6.00@lb dis 30

Wrenches.

Coe's genuine, cash in ten days ..... dis 50
Girard Standard ..... dis 70&10
Agricultural ..... dis 75&10
Mechanics' ..... dis 55&10,& 3
Bemis & Call's Combination ..... dis 35
Donohue's Engineers ..... dis 20&10
Lamson & Sessions Engineers ..... dis 60
Billings & Spencer's Drop Forged ..... dis 10
William's " " ..... dis 10
Alligator " " ..... dis 40

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Patent Automatic Feeder
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BOILER SCALE SOLVENTS.

Feeds regularly and automatically, so as to keep the water in boiler constantly impregnated with whatever solvent is used. Most effective in the market. Address the manufacturers,

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DAYTON, OHIO.

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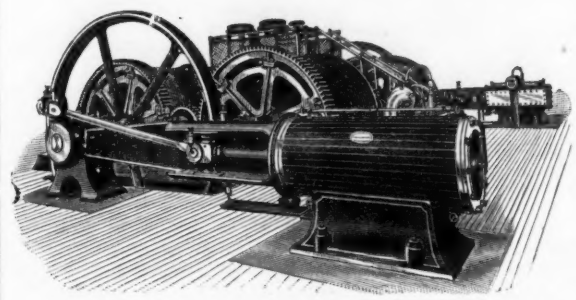

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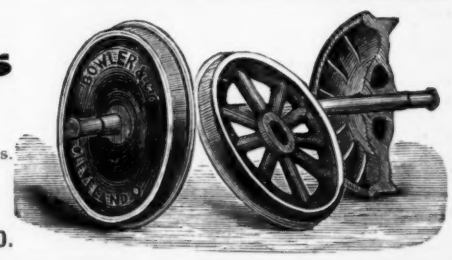

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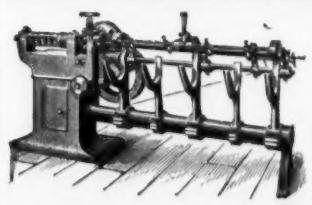

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PURE STEEL A SPECIALTY.
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Augers and Bits.

Common augers and bits.....dis 70
Nell's.....dis 60&5
Cook's Douglass Mfg. Co.....dis 55
Russell Jennings' augers and bits.....dis 25
Expansive Bits, Clark's small, $18; large, $26.....dis 35@35&5
Hollow Augers, Ives'.....dis 25&10
Hollow Augers, Bonney's Adjust. ₩ doz., $48.....dis 40&10
Hollow Augers, Stearns' Adjust. ₩ doz., $48.....dis 20&10
Gimlet bits, common.....per gross $2 75@3 25
Standard Bit Stock Drills.....dis 50&10&5
Ship Augers.....dis 15&10@15&10&5

Axes.

Makers' and Special Brands—
First quality.....₩dox. $6 00@6 50
Others.....₩doz. $5 50@5 75
Full polished.....$8 00

Bolts.

Cast iron barrel bolts.....dis 70@70&10
Cast iron shutter bolts, etc.....dis 70@70&10
Cast iron chain bolts.....dis 65&10
Ives' patent door bolt.....dis 60
Wrought iron barrel bolts.....dis 70@70&10
Wrought iron square bolts.....dis 70@70&10
Wrought shutter bolts.....dis 60&10
Sargent's list
Carriage, common, new list.....dis 75&10
Tire, common, new list.....dis 70
Carriage and tire, Philadelphia pattern.....dis 75&10
Stove bolts.....dis 62½
Plow bolts.....dis 60&5
Machine.....dis 75&10@80
Ends.....dis 75&10&80

Buckets, Elevator.

.....dis 50&10

Butts.

Wrought brass.....dis 70@70&10
Cast brass, loose joint.....dis 33⅓&10
Cast Iron—
Fast joint, narrow.....dis 50&10&5@60&5
Fast joint, broad.....dis 55&10&5@60&10
Loose joint.....dis 70&10@75
Loose joint, jap.....dis 70&10@75
Loose joint, jap. with acorns.....dis 70&10@75
Loose pin, acorns.....dis 70&10@75
Loose pin, japanned acorns.....dis 70&10@75
Loose pin, acorns, jap. plated tips..dis 70&10@75
Wrought steel—
Wrought, fast joint, narrow.....dis 70&10@75
Wrought, fast joint, broad.....dis 70&10@75
Wrought, loose joint, broad.....dis 70&10@75
Table Butts, back flaps, etc.....dis 70&10@75
Regular inside blind.....dis 70&10@75
Light inside blind.....dis 70&10@75
Loose pin.....dis 70&10@75
Light loose pin.....dis 70&10@75

Chains.

Trace, 6½-10-2.....₩ pair 1.03
Trace, 6½-10-3.....₩ pair .92 } 50&10@50&10&5
Trace, 7-10-2.....₩ pair 1.11
German Halter Chain, list June, 1887...dis 50&10
German Coil, list of June, 1887..dis 50&10&5@60
Galvanized Pump Chain.....₩ lb5½@6
Jack Chain, Iron.....dis 75@75&5
Jack Chain, Brass.....dis 70@70&5

Chisels.

Socket Framing and Firmer.....dis 75&5@75&10
Socket Framing and Firmer, Buck Bros..dis 30
Socket Firmer and Framing, L. & I. J. White.....dis 30@30&5
Tanged Firmers.....dis 40&10

Cutlery.

Table.....net
Excelsior Pocket.....net

Gimlets.

Nail and Spike.....dis 50&10&5
Double cut, low list.....dis 25
"Bee".....₩ gross $12, dis 25@25&5

Hangers.

Barn door, old patterns.....dis 10&10@70
Climax, (Anti-Friction).....dis 70
Star.....dis 40&10@40&10&5
Scranton.....dis 40
Kidder's.....dis 50&10@60
Terry's Patent.....5 in., $12; 4 in., $10, dis 50&5
Paragon.....dis 40&10
Richard's.....dis 30@30&10

Horse Nails.

	No.	10	9	8	7	6	
Ausable, ₩ lb.		23	24	25	26	28.	dis 25&10@25&10&10
Putnam, ₩ lb.		18	19	20	21	23.	dis 15
Essex							dis 25&10@25&10&10

Horse Shoes.

Burden, at factory.....₩ keg $4 00
R. I. Horshoe Co., Perkins' Imp. at factory.....₩ keg $4 00
Mule Shoes, at factory.....₩ keg $5 00

Knobs.

Carriage, japanned.....₩ gross 80c dis 60&10
Base, rubber tip.....dis 70&10&5
Hemacite door knobs, new list.....dis 40&10@50
Door mineral.....dis 65c@68c
Door Por. japanned.....dis 75c@78c
Door Por. nickle.....$2 00@2 25
Door Por. plated.....$2 00@2 25

Locks, Bolts, Etc.

P. & F. Corbear, Locks and Bronze Goods.
Door locks, knobs and latches.....dis 60
Escutcheons and keys.....dis 60
Padlocks and padlock keys.....dis 66⅔
Bell pulls, mineral, porcelain and jet.....dis 60
Bell pulls, genuine bronze.....dis 60&10
Lever bell pulls, genuine bronze.....dis 60&10
Butts', genuine bronze.....dis 60&10
Butts' bronze plated.....dis 60&10
Store door locks and latches.....dis 60&10
Store door handles.....dis 60&10
Shutter hinges&flaps,genuine bronze.dis 60&10
Shutter hinges, bronze plated.....dis 70
Flush bolts, genuine bronze.....dis 70
Shutter knobs, genuine bronze.....dis 50
Shutter bars, genuine bronze.....dis 60
Sash lifts, genuine bronze.....dis 60
Sash pulls and plates, genuine bronze.....dis 60
Push plates, genuine bronze.....dis 60
Drawer pull, genuine bronze.....dis 66⅔
Letter box plates, genuine bronze....dis 60&10
Barn door locks.....dis 33⅓

Plumbs and Levels.

Standard list.....dis 70&10@70&10&10
Pocket levels.....dis 70&10@70&10&10
Davis' inclinometers.....dis 10&10

Pumps.

Cistern, best makers.....dis 50&10@60
Pitcher spout, best makers.dis 60&10@60&10&10
Pitcher spout, cheaper goods dis 70&5@70&10&5

Pokes, Animal.

Bishop's I. X. L.....₩ doz $6 50
Bishop's O K.....₩ doz $6 50
Bishop's Pioneer.....₩ doz $3 75
Bishop's American.....₩ doz $3 00

Rakes.

Cast steel.....dis 65
Malleable.....dis 70@70&5

Razors.

J. R. Torrey Razor Co.....dis 20
Wostenholme & Butcher.....$10@⅞...dis 10
Rifle razor.....dis $9 50 net

Scales.

Hatch, Counter, No. 171.....₩ doz $21 00
Hatch, Tea, No. 161.....₩ dox $6 75@7 00
Chatillon's Grocers.....dis 50
Family Turnbulls.....dis 30@30&10
Scale Beams, List of January 12, 1882.....dis 50&10@50&10&4

Screw Drivers.

Stanley R. & L. Co.'s Varnished Handles.....dis 65&10
Stanley R. & L. Co.'s Black Handles..dis 60&10
Sets interchangeables.....₩ doz $18 dis 25

Squares.

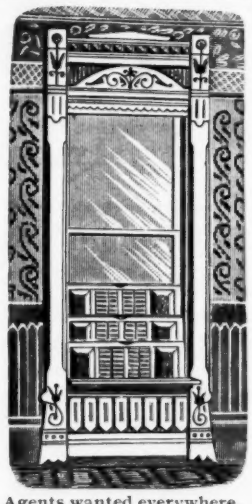
Steel and iron, Nickel plated.....dis 75&10@80
Disston's try square and T bevels.....dis 45&10
Winterbottom's try and miter.....dis 30&10

Tacks, Brads, Etc.

New List, January 2, 1888.

American iron carpet tacks all kinds.....dis 80@80&5
Steel carpet tacks all kinds.....dis 80@80&5
Swedes iron carpet tacks, all kinds.....dis 80@80&5
Swedes iron tacks.....dis 75&5@75&10
Swedes iron Upholsterers' tacks.....dis 75&10@75&10&5
Tinned Swedes iron tacks..dis 75&10@75&10&5
Tinned Swedes iron Upholsterers' tacks.....dis 75&10@75&10&5
American iron cut tacks.....dis 75@75&10
Copper tacks.....dis 50&10
Copper finishing and trunk nails.....dis 50&10
Cigar box nails.....dis 50&10@50&10&5
Finishing nails.....dis 70&10@70&10&10
Hungarian nails and miners' tacks.....dis 70&10@70&10&10
Gimp and lace tacks.....dis 75&10@75&10&5
" " " tinned.dis 75&10@75&10&5
Trunk and clout nails.....dis 70&10@70&10&10
Tinned trunk&clout nails.dis 70&10@70&10&10
Basket nails.....dis 70&10@70&10&10
Chair nails.....dis 70&10@70&10&10
Common and patent brads.dis 70&10@70&10&10
Tinned capped trunk n'ls..dis 70&10@70&10&10

Hartman's Patent Inside Sliding Window Blind



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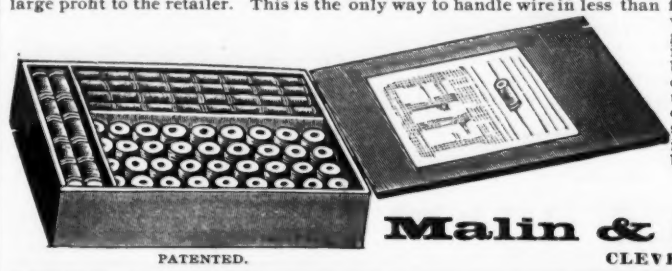
This assortment contains over 140 Spools of Black and Tinned Annealed Steel, Copper and Brass Wire, and Comprises almost every size likely to be called for. It has been put up by us especially to meet the demands of the Retail Hardware Trade, and it covers all of the most salable sizes without any dead stock. It will readily bring over $10.00 at retail and represents a large profit to the retailer. This is the only way to handle wire in less than full bundles, as it will not rust, tangle or tarnish, and is convenient for both dealer and consumer. Write us for a net price on the whole assortment, or order it from your jobber.



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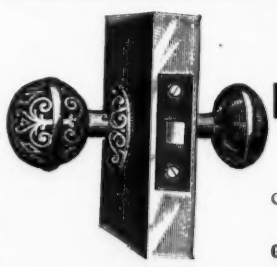
Specially adapted for A No. 1 Boiler Plates, Boiler Rivets, Wire Rods, Stay Bolts, Stamping Ware, Nail Plates, etc. Will contract to completely erect, equip and place in operation blast furnaces, Whitwell stoves and steel plants as above. As I manufacture at my own works, everything appertaining to blast furnace and steel works construction I can guarantee promptness and satisfaction.



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Burglar Window Alarms.

Cheapest, most Reliable and most durable Burglar Alarms on the Market.

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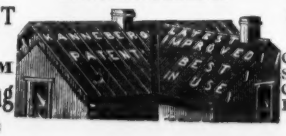
MANUFACTURER OF
STEAM BOILERS
Also Smoke Stacks, Tanks, Pans, Breachings, Heaters, Etc.
Works just North of Union Passenger Depot, RICHMOND, IND.
Write for Estimates.

The Kanneberg Roofing Co., Canton, O.,
(The Originators of Strictly Genuine Steel Roofing.)
MANUFACTURERS OF
THE KANNEBERG PATENT
LATEST IMPROVED FOLDED LOCK SEAM
Strictly Genuine Steel Roofing
WRITE FOR CATALOGUE, PRICE



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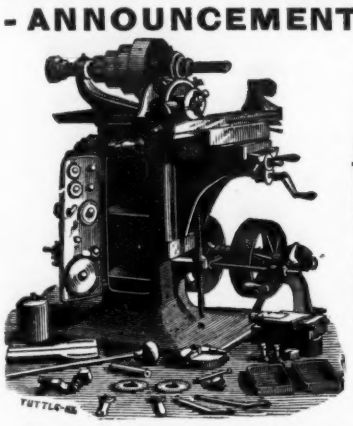
(Four Sizes of Corrugations.)
Crimped Edge Iron Roofing and Siding, Beaded Iron Siding and Ceiling, Water Proof Building Paper, Ready-Mixed Paints, Etc.
LIST AND SAMPLES.

- ANNOUNCEMENT! -



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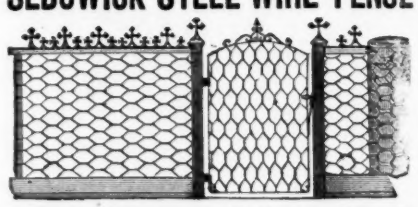

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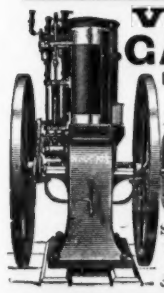

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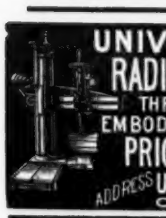

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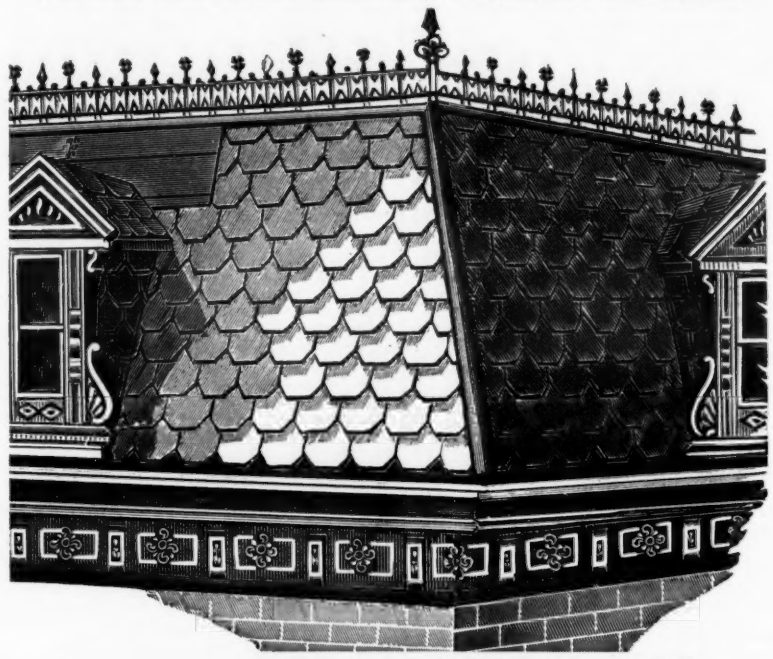

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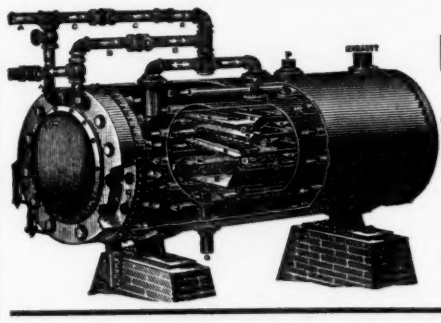

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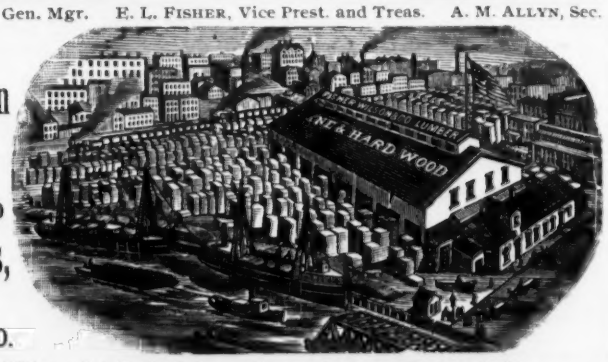

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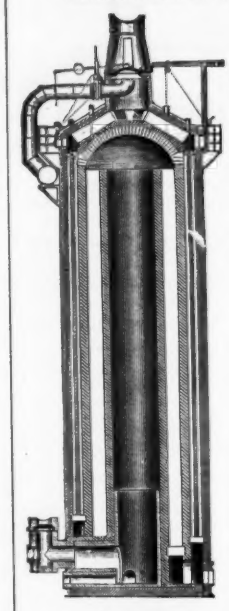

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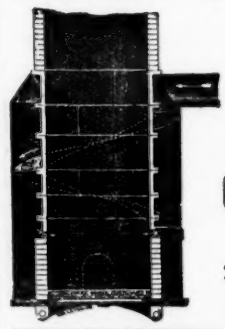

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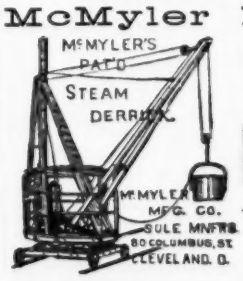

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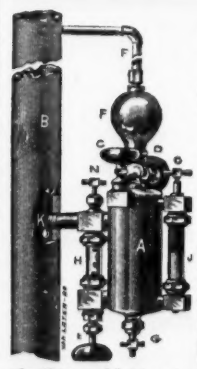

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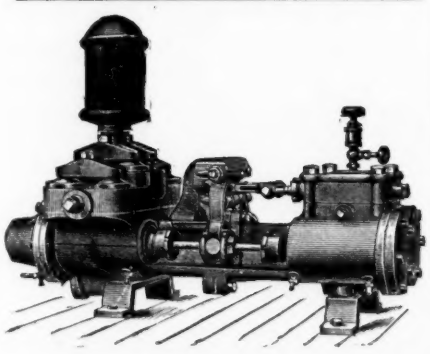

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For Mackinac and Lake Huron ports take Thursday's steamer. City ticket office 224 Bank street. †Daily except Sunday.

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GANG LATH MILL
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FAST TIME. NO DELAYS.

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Through valleys green, 'mong mountains ser-
The people's favorite route I ween, [ried,
The P. & L. E. sits enthroned as queen."

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ERIE, PA., U. S. A.

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TRAVELERS' REGISTER.

Standard Time.
Revised March 6th, 1888.

N. Y., C. & St. L. R. R. Co.—"The Nickel Plate."

Eastward.	Arrive.	Depart.
Buffalo Passenger	10 40 a m	10 45 a m
Chicago Passenger	9 20 p m	.....
Local Freight	4 30 p m	.....
Westward.	**Arrive.**	**Depart.**
Chicago Passenger	.....	6.30 a m
Fostoria Passenger	5 06 p m	5 11 p m
Local Freight	1 00 p m	.....

Rocky River Accommodation departs 7:40 a. m.; 1:40 p. m.

Euclid Accommodation departs 6:20 a. m.; 4.55 p. m.

All trains daily, except Sunday.

Cleveland & Pittsburgh.

	Arrive.	Depart.
New York Express	12 50 p m	7 45 a m
New York Express	6 35 p m	1 05 p m
Alliance & Akron Accom	9 35 a m	3 25 p m
Ravenna Accommodation	8 25 a m	5 00 p m
Night Express	*5 25 a m	*11 10 p m

*Daily; all other trains daily, except Sunday.

Mt. Vernon & Pan Handle Route.

C., A. & C. Ry. Co.	Arrive.	Depart.
Akron, Col. & Cin. "Flyer"	5 40 p m	8 10 a m
Akron, Col. & Cin. Night Express	7 00 a m	8 00 a m
Akron, Col. & Zanesv'e Ex.	12 50 p m	1 95 p m
Akron & Orrville Accom	9 35 a m	3 25 p m

The 8 p. m. train runs daily. Elegant Pullman palace sleeping cars attached. All other trains daily, except Sunday.

Erie Railway.

Depot, South Water Street and Viaduct.

	Arrive.	Depart.
N. Y. & Pitts. Express	‡5 38 a m	*8 25 a m
Fast N. Y. & Pitts. Express	*10 55 a m	*3 00 p m
Mahoning Accommo	.....	†6 40 a m
Pittsburgh Express	†6 25 p m	.....
Youngstown Local	†8 05 a m	.....
Mahon'g div. & Pitts Local	.....	*11 40 a m
Mahoning Val. Accom	.....	†4 30 p m
Pittsburgh Express	†1 20 p m	11 10 p m
New York Express	*8 00 p m	.....

*Daily. †Daily, except Sunday. ‡Daily except Monday.

Cleveland & Canton Railroad.

Depart—
Canton and Coshocton—7:30 a. m., 4:05 p. m.
Bedford—7:30 a. m., *9:00 a. m., 11:10 a. m., 2:00 p. m., 4:05 p. m., 5:45 p. m., *8:15 p. m.
Newburgh—6:10 a. m., 7:30 a. m., *9:00 a. m., 11:10 a. m., 2.00 p. m., 4:05 p. m., 5:45 p. m., *8:15 p. m.
Kent—7:30 a. m., *9:00 a. m., 4:05 p. m., *8:15 p. m.
Arrive from—
Canton and Coshocton—9:50 a. m., 6:25 p. m.
Bedford—6:00 a. m., *7:40 a. m., 9:50 a. m., 1:05 p. m., 4:15 p. m., 6:25 p. m., *7:15 p. m.
Newburgh—6:00 a. m., 7:10 a. m., *7:40 a. m., 9:50 a. m., 1.05 p. m., 4:15 p. m., 5:35 p. m., 6:25 p. m., *7:15 p. m.
Kent—*7:40 a. m., 9:50 a. m., 6:25 p. m., *7:15 p. m.

Theatre train leaves Cleveland every Saturday night for Newburgh and Bedford 10:35 p. m.

Trains marked with * run daily. All others daily, except Sunday.

Depot at Ontario St., opposite Huron St.

Valley Railway.

FOR AKRON, CANTON AND MARIETTA

Depot foot South Water Street.

	Depart.	Arrive.
Valley Junction Mail	*7 45 a m	*6 30 p m
Marietta Express	†11 15 a m	†2 30 p m
Valley Junction Express	*4 15 p m	*10 15 a m
Cleve. and Canton Express	*7 00 p m	†8 15 a m

*Daily. †Daily, except Sunday.

WM. THORNBURGH, Gen. Manager. R. A. CARRAN, Gen. Pass. Agt.

Cleveland, Lorain and Wheeling.

All trains arrive and leave the Union Depot as follows:

	Depart.	Arrive.
Wheeling Express	6 45 a m	6 55 p m
Uhrichsville Express	4 00 p m	9 20 a m

OSCAR TOWNSEND Gen. Mang'r.

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Direct connections at Union Depots, with all great through lines to all Points

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—AND—
PICTURESQUE ROUTE
—TO—
New York, Boston and the East.

The shortest and quickest Route to Pittsburgh, Washington and Baltimore & the Southeast.

New Central Depot So. Water St. and Viaduct.

	Depart.
No. 62, Accommodation	† 6 00 a m
No. 72, New York Express	* 8 30 a m
No. 72, Fast Pittsburgh Express	* 8 30 a m
No. 64, Fast Pittsburgh Express	* 3 00 p m
No. 66, Mantua Accommo	* 4 20 p m
No. 68, Pittsburgh Express	†10 50 p m
No. 68, New York Express	†10 50 p m
No. 70, Pittsburgh Local Express	†11 40 a m
No. 74, Youngstown Express	† 4 20 p m
	Arrive.
No. 65, Fast New York Express	*12 50 p m
No. 61, Pittsburgh Express	* 7 35 a m
No. 67, Pittsburgh Express	†10 55 a m
No. 63, New York Express	* 6 50 p m
No. 63, Pittsburgh Express	* 6 50 p m
No. 69, Pittsburgh Local Express	† 9 00 p m
No. 73, Accommodation	† 7 25 p m

*Daily. †Daily, except Sunday.

Baggage checked through to all points East.

Through tickets and information regarding the route can be obtained at office, 141 Superior street, and at Depot N. Y., P. & O. Railroad, South Water street and Viaduct, Cleveland.

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L. P. FARMER, Gen. Pass. Agt., New York.
W. C. RINEARSON, Ass't G. P. A., Cleveland, O.
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LEHIGH VALLEY ROAD

will experience the pleasure of a trip through the most magnificent and picturesque scenery in the world, presenting an ever-varying panorama of delightful surprises.

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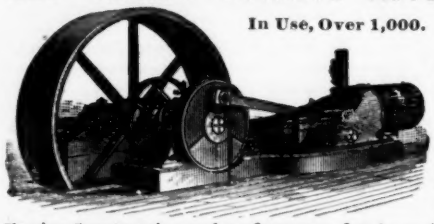

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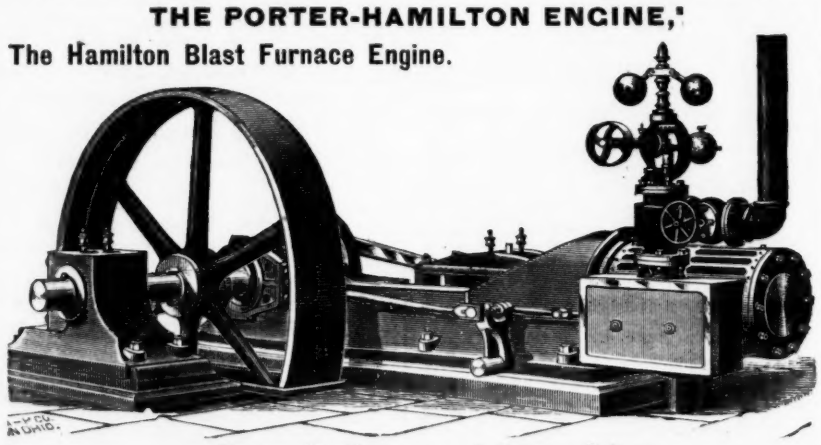

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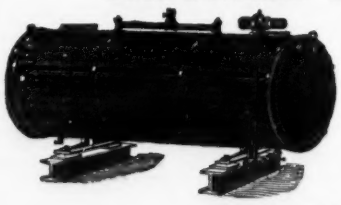

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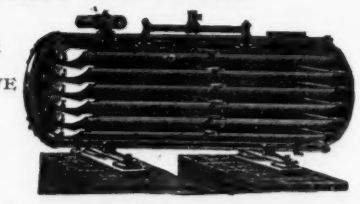

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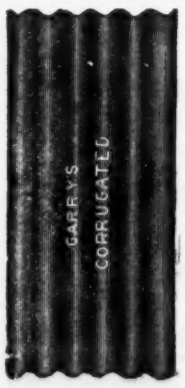

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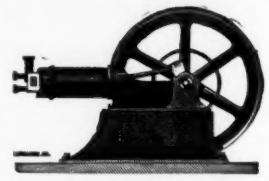

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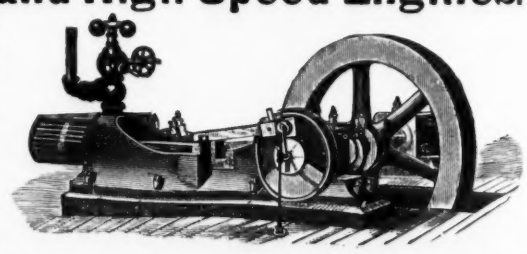

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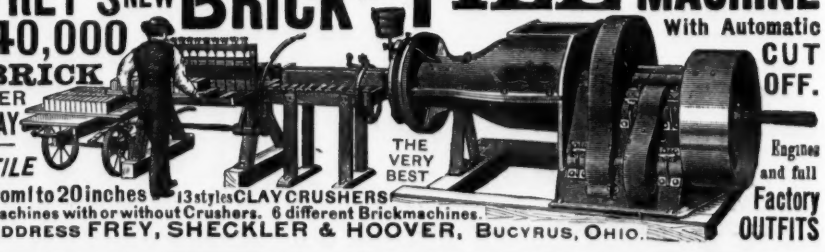

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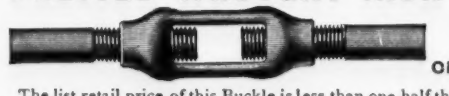

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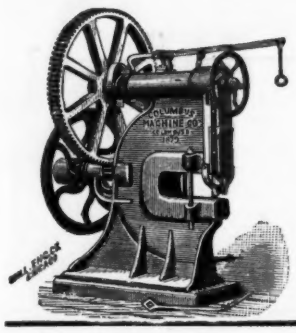

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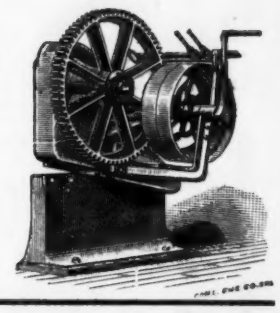

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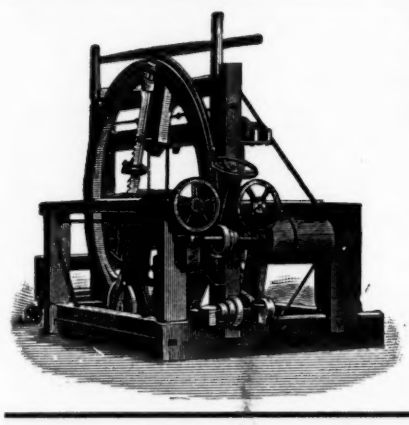

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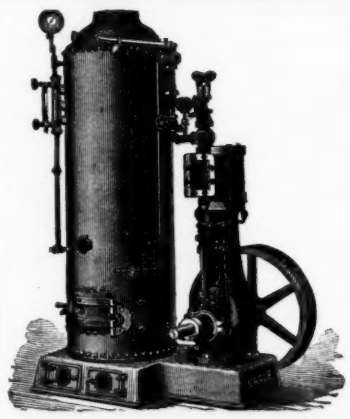

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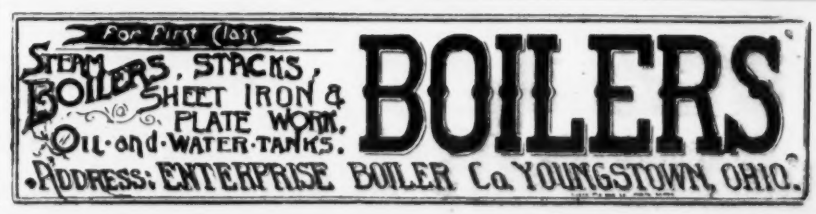

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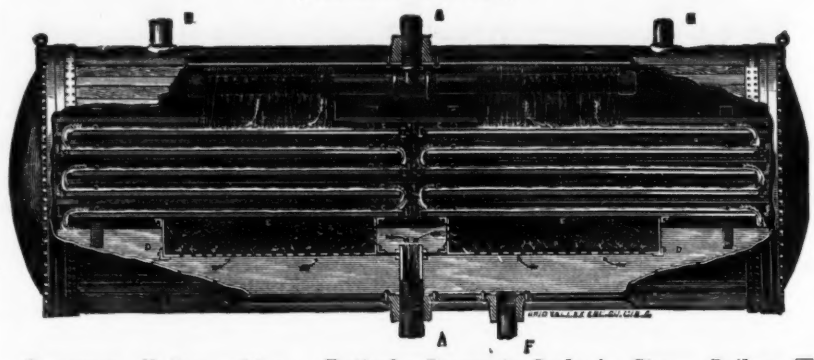

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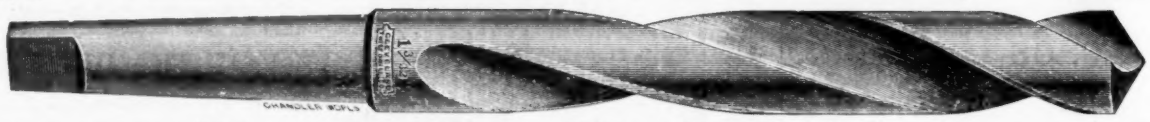

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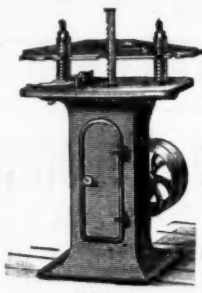

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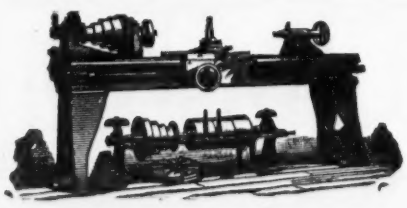

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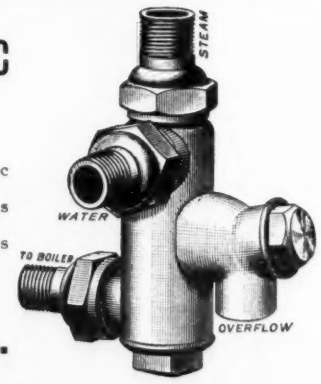

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